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FACTS ABOUT

PEAT

As an Article of Fuel.

WITH

REMARKS UPON ITS ORIGIN AND COMPOSITION, THE LOCALITIES IN
WHICH IT IS FOUND, THE METHODS OF PREPARATION AND
MANUFACTURE, AND THE VARIOUS USES TO WHICH
IT IS APPLICABLE; TOGETHER WITH MANY
OTHER MATTERS OF PRACTICAL OR
SCIENTIFIC INTEREST.

COMPILED BY

T. H. LEAVITT.

ISSUED BY
LEAVITT & HUNNEWELL,
49 Congress Street, Boston.
1865.

1. Peat.

S. & T. D.

FACTS ABOUT

PEAT

As an Article of Fuel.

WITH

Remarks upon its Origin and Composition; the Localities in which it is found; the Methods of Preparation and Manufacture of Peat and Peat-Charcoal for Fuel; its use in the Smelting and Manufacture of Iron, Steel, and other Metals; its superiority as a Fuel for generating Steam under Stationary, Locomotive, and Marine Engines; for the Production of Gas; the various Products obtained from it by Distillation; the use of Peat in the Manufacture of Gunpowder and Paper, and for Pavements, Roofing Tiles, and various articles for Building and Ornamental Work; together with many other matters of practical or scientific interest.

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PEAT AS AN ARTICLE OF FUEL.

PRELIMINARY REMARKS.

"THE importance which, in every age from the earliest period of human existence, must have been attached to fire, and the necessity which has ever impelled mankind to provide for it, not so much for purposes of luxury as an absolute essential to enable them to counteract the effects of climate and other external influences which affect the human frame, are sufficient, apart from any other considerations, to impress every one with a sense of its usefulness."

Nations, however rude or barbarous, have always made use of fire as a source of comfort or luxury, as a means of preservation, or as a destructive agent. The history of its application in relation to these three objects would go far toward illustrating a comprehensive view of the advance of civilization.

It is not in reference to these primary applications, however, that the full value of fire, or the extent of its influence, will be understood, but only when it is studied in connection with the various natural and artificial transformations of matter which it tends to produce.

Not only do the attributes of fire exert a gigantic influence in the various social requirements, but in the most minute as well as the most elaborate changes which take place in nature.

Heat and light, indeed, seem to be the life-giving principles of the material world, and are not less essential to man in subduing matter to his service.

Some kind of fuel has always been an article of prime necessity to man ; at least from the time when he began to prepare his food by the heat of fire, or had learned to prize its comfortable warmth in the cold of winter. As experience was gained in the properties and uses of materials about him, the applications of fuel to supply his increased wants were multiplied.

By means of it, clay was converted into better bricks than those baked in the sun ; limestone was burned for cement ; and the ores were made to give up the valuable metals which they held concealed with a grip so fast, that nought but fire could disengage or reveal them: and the subsequent treatment of these for obtaining the articles they were fitted to produce was also wholly dependent on the use of fuel.

So from the fruits of the field were obtained by various processes, alike dependent on the combustion of fuel, new products, the continued preparation of which, in many cases, adds not a little to their value. Indeed, most of the operations in the useful arts require, directly or indirectly, the application of artificial heat.

But the comparatively modern discovery of its being the most available source of motive-power has given to it a new importance hardly inferior to that derived from its other uses ; causing it to contribute more than all other resources of nations to their wealth and prosperity.

It may be said that the political power of the United States, Great Britain, France, or any other civilized country, is due not so much to their armies or navies — for these are defensive, not productive — as to the great development of their manufactures ; and these are in great measure dependent upon an abundant supply of fuel, easily procurable, and at cheap rates.

The means of obtaining this, then, are of first-rate importance in every manufacture ; and the question of its supply, preparation, and most economical application, are of the highest interest.

Among the material sources of heat, all the substances chemically termed *combustible* may be regarded as particular kinds of fuel ; although the name is usually restricted to organic products of ligneous origin, such as woody matters, — peat, coal, and the like.

The substances usually employed as fuel are *wood*, *peat*, and *coal*, either in their natural state, or modified by peculiar treatment.

The abundance of all or either of these in a country must always constitute a principal source of its wealth, more especially since steam has become the moving-power of manufacturing industry as well as the great agent in locomotion.

It is evident, therefore, that none of the productions of nature should be more carefully husbanded than those which can be used for fuel.

Every attempt also to improve the quality of inferior materials, so as to increase their efficiency as heat-producers, and consequently their value, should be liberally encouraged.

The term " fuel " is commonly applied only to substances originally derived from the growth of plants; as wood, peat, charcoal, coke, and the various kinds of mineral coal. Even thus limited, it might properly include the inflammable gases and oils which are used of late for the sake of the heat generated by their combustion.

For objects requiring a quick heat, and at the same time diffused over a considerable space, the most inflammable fuels are found most efficient.

The results of numerous experiments, practical as well as scientific, go to show that peat, in its rudely prepared state, goes far toward answering these requirements; and, when solidified, it is for most purposes superior.

Wood, peat, and coal, though so different in physical appearance, are nevertheless very closely allied in composition; all the three being chiefly composed of ligneous fibre, a compound of four simple elements, — carbon, hydrogen, oxygen, nitrogen.

Physical effects have induced certain changes in some kinds of peat and coal, which cause them to differ considerably in their properties from woody fibre: but, by observing the action which analogous artificial agencies exert upon the latter, a remarkable coincidence is observed; and sufficient data are found for inferring that woody fibre is the basis of these substances, although, in the course of time, they have passed through various chemical transformations, differing in some particulars according to locality, temperature, &c.

The analogy which exists between peat and coal is perhaps more readily perceived; and it may reasonably be inferred that coal, like peat, has been produced by the decomposition of species of organic growth. All who have given attention to the composition of the two substances, and the geological positions occupied by each, seem to concur in this view of the subject.

It may be said that the process which has operated to convert countless reproductions of plants into peat-bogs has been similar in the case of coals, to some extent; but, geologically considered, it is evident that the oldest peat deposits are of modern formation, when compared to the most recent beds of coal.

Of the vegetal origin of the former, no doubt can be entertained: it is apparent to the most casual observer. Of a like origin of the latter there can be no more doubt; since, among other indications, large masses of vegetable forms, and even trees, have been found in their natural positions converted into coal; and in the more compact varieties the microscope has revealed conclusively a similar origin.

We do not propose to follow this portion of our subject, interesting as it is; but leaving geologists to discuss and settle disputed points as best they may, and referring our readers to papers *ad infinitum* which have been published upon the subject, we shall take it for granted that peat had an origin; that it exists, and is "good;" and apply ourselves to practical matters concerning it.

Of peat as an article of fuel, comparatively little is really known in this country; although in numerous places in the Northern States, especially in the New-England States, it is now, and has been for many years, used to a limited extent in its crude state, and highly esteemed for domestic purposes. The writer, during a series of inquiries and investigations on the subject, has often been amused at the warm interest manifested by some honest old farmer as he gave a glowing account of the comforts of a rousing peat-fire on a stinging cold night. When properly cured, it burns freely; gives a steady and intense heat; and the uniform testimony of those who use it bears witness to its superiority in many respects.

Of wood and coal in all their variety, the manner of preparation, and use as fuel for domestic and manufacturing purposes, the community may be said to need no information: their use is so common and universal, that all have constant practical experience of their nature and value.

Not so with peat: it is by no means so generally used. Its value may be said to be unknown; and even those who have used it in its crude state do not appear to realize the increased value it would possess, and the extent to which it might be used, especially for manufacturing purposes, if properly prepared, and placed in the market.

We have, then, to treat of it, to some extent, as a new article; and, without in any wise attempting or pretending to offer all that might be said of it, it will be our aim to give briefly such facts in regard to it as have come under our own observation, or which we have been able to gather from a variety of sources, and that with a view to interest the community to the development and use of those rich resources of fuel which lie about us, in quantities sufficient for the demands of ages, and which require only ordinary enterprise and skill, with moderate means, to develop.

There has been comparatively little published in this country upon the subject; and the experiments made and the results realized have not been so scientifically conducted nor so accurately reported as in Europe. Much has been done in both countries to demonstrate its properties and value; and it seems to have been a common aim of all who have undertaken its manufacture or use to condense and solidify it, and put it in merchantable shape.

The number and variety of machines and devices which have been invented, patented, or attempted to be used, for these purposes, is astonishing: and, although all have agreed that such results were practicable, few have actually arrived at any thing like a satisfactory method of preparing it; and none, so far as we are yet aware, have arrived at that complete success which is essential to the profitable and universal introduction of an article of this character.

It is now apparent that most of the attempts referred to have failed of success from the fact that the nature of the article was not comprehended; and the principle generally started upon, to wit, that it could be condensed and produced in good merchantable shape by means of powerful pressure applied in one form or another, was wrong. This will hardly be credited; but facts prove it to be the case.

Peat is a curious substance, possessing peculiarities of a very interesting character, some of which will appear as we progress in these pages. The fact that it is exceedingly elastic, presenting in this respect some of the characteristics of India-rubber or gutta-percha, and also that it is remarkably tenacious of water, will account to some extent for the impossibility of producing, by pressure alone, a solid, dry substance.

A process has, however, recently been discovered and applied, by which peat may be converted into a solid, dry fuel, in good shape, in large quantities, and at moderate cost.

The machinery and process are exceedingly simple; are within the means of any farmer; and, we doubt not, will be very generally and speedily introduced. They have been patented, as most inventions of the present day are: but it is the aim of the parties having the control of the matter to encourage and stimulate the manufacture of the article; and to this end they are granting the right to work under their patents, and furnishing the necessary machinery and instructions at rates which are within the reach of any enterprising man.

Of the purposes to which peat as a fuel can be applied, and the manner in which it can be used, the range is as wide as for wood or coal, or both.

For domestic purposes,—as the heating of dwellings, whether by furnace, or any of the innumerable varieties of stoves or the open grate,—it is equal if not superior to wood or coal of any kind, save only the fact that it requires, in most cases, to be replenished more frequently than coal; but it gives a more steady, intense, yet mellow and agreeable heat than any other fuel. In open grates, as a substitute for cannel coal it is admirable, and produces the most cheerful fire imaginable.

In manufacturing and mechanical establishments it is available wherever fuel is required, and for many purposes possesses characteristics which render it decidedly superior; as, for instance, the production of iron and steel, and the working and manufacture of them, where the simple fact of the entire absence of sulphur or any substance prejudicial to the quality of the metal is a consideration of immense value.

For generating steam, it is, when solidified, second to no other fuel, and superior to most. It ignites freely; burns with considerable flame; gives an intense heat; and leaves no residuum except a fine light ash, which passes off freely, and leaves the grate-bars always free and clear,—a consideration which will be readily appreciated by any fireman or engineer who has had a single day's experience with the dross and clinker, which is inevitable where coal is used.

A mass of facts have from time to time been published, which go to prove the truth of these statements; and the few which we shall be able to give in these pages, and the authorities to which we shall make reference, will, we think, satisfy even the most sceptical that the matter is at least worthy of investigation and experiment.

If, then, we have at our own doors an article of fuel equal or superior to that which we now bring from a great distance, and upon which we are, and for many years have been, mainly dependent, is it not apparent that an immense field for enterprise is open to us, even though the actual gain were confined to the single item of cost of transportation saved? But it is probably true, that, in ordinary times, peat can be excavated, prepared, and cured ready for use, at less cost than coal can be mined, and prepared for shipment.

Through a very large portion of the territory of the Northern States, the deposits of peat are so freely distributed that it would probably average as near a market or place of consumption as does the ordinary supply of wood now used for domestic purposes.

For the supply of iron-works, machine-shops, and manufacturing establishments, whether for the purpose of working the metals or generating steam for power, it will, in most cases, be found that deposits of peat lie within a short distance of the place of consumption; and for some of our largest establishments, requiring immense amounts of fuel, it is known that supplies of an extent equal to their requirements for many years lie almost at their doors.

So too, for our railroads, peat is *the* fuel. It is easily handled; ignites almost instantly; burns freely, leaving no residuum excepting light ashes, so that the grate-bars are always clean; and generates steam in a manner to charm the most exacting engineer.

There are, along the line of every railroad in New England, deposits of excellent peat, equal to their requirements for years to come; and it would seem more than probable, in view of all these facts, that, within a very short time, many of our manufacturing establishments, and all our railroads, will have each their own peat-meadow and fuel-factory: the practical results of which will be, as relates to manufacturing establishments, either a reduction in cost to the consumer of the articles and fabrics produced, or increased dividends to stockholders, or both; as relates to metals, and the various articles into which they are manufactured, superior quality, temper, &c., and a consequent increase of value, without increase of cost; and as relates to steam-power for transportation by land or water, a diminution of cost, which may inure, by the reduction of rates, to the benefit of the travelling and commercial interests, or, without reduction of rates, to the gain of stockholders; or, by such management as may be most reasonably anticipated, the results would in all probability prove favorable to the interests of all concerned.

Prof. Emmons remarks, "There is one consideration which commends itself to the philanthropic of all our large cities; viz., the introduction of peat as a fuel to supply the necessities of the poor. It is believed that much suffering may be prevented and much comfort promoted by the use of peat in all places where fuel is expensive, as in New York and Albany. A careful examination, therefore, of places favorable to the production of this substance, is a matter of some considerable importance, as it is the next best substitute for the more expensive article, coal; and any thing for fuel which will save a further destruction of the forests, both in New York and the New-England States, is worthy of adoption from more considerations than one. A due proportion of woodland to that under tillage adds greatly to the beauty of any district of country; but, above all, the preservation of timber-lands is becoming a matter of great moment, and calls for legislative aid and encouragement." He adds, "We have, therefore, in this homely substance of peat, an invaluable article, of which prejudice alone can prevent a general use."

Without further preliminaries, we will proceed to give briefly some of the theories or probabilities as to the origin and formation of peat, the localities in which it is found, the principal varieties, some of the methods by which it has been prepared, others perhaps which have been attempted, some facts as to the manner in which it has been used, and the purposes for which it has been used, with such other incidental matters of scientific or practical interest pertaining to the subject as may have come to our knowledge, together with such reference to published information as will enable any so disposed to pursue the subject to an extent beyond the limited space which it is our purpose to devote to it.

ORIGIN AND COMPOSITION OF PEAT.

Peat is the spongy substance found in almost every country, filling up cavities in the surface, and constituting what is termed *bog*.

It varies in color from light brown to black, and in consistency from that of a bran paste to that of clay in the bank.

The natural history of peat has puzzled inquirers a great deal; and explanations of its origin, hardly less discordant than those recorded on the subject of fossil coal, have been entertained and defended. It is unquestionably of vegetal origin, and is the result of decomposition to a certain stage, modified or affected by the agency of air, water, temperature, time, and pressure. It was once supposed that this formation was, in point of time, co-eval with the disposition of the face of the country into hills and valleys. By some it was considered a bituminous deposit from the sea, — the wreck of floating islands previous to the great convulsions which the earth underwent during the formation of the present continents and islands.

By others it was even regarded as an organic substance in a state of vitality, and actually growing: but these and many other notions and theories, at times entertained, are abandoned;

and more rational and philosophical views of its nature and production are adopted.

It is found, on examination, to be composed of vegetal matters; generally mosses, and species of aquatic plants in different stages of decomposition: and from this circumstance, as well as from the general appearance of the localities where peat abounds, its formation is generally accounted for somewhat as follows: —

Where pools of water collect, the soil under which is retentive, the water, not being absorbed, stagnates, and, provided the surface evaporation is not great, forms a pond. Around the borders of this pond various kinds of aquatic plants — sedges, rushes, &c. — soon make their appearance, and, by reproduction, gradually creep in towards the centre, until the whole surface becomes covered. In process of time, when several races of these have succeeded one another, and mud and slime have accumulated at the roots and around the decaying stems, a spongy mass results, which is well calculated for the propagation of mosses.

Under a constant supply of moisture, these various species thrive, continue to luxuriate, and, by progressive growth, ultimately give rise to a composition in every respect similar to that constituting the various peat-bogs.

That some such natural process has been the cause of the production of peat, appears from its composition, and the localities in which it is found. These are chiefly in the temperate zones, where evaporation is slow, and the atmosphere is generally more or less saturated with humidity.

It may be conceived, that, in the origin of these formations, the retention of the water, whether from rain or springs, in extensive basins, led at first to the development of vegetal growth in the manner above indicated; and that, the necessary moisture being supplied in abundance, the accumulation became so rapid, that ultimately the surface assumed the appearance of land; and, as decomposition proceeded, a degree of solidity was given to the mass, equal to the support of denser bodies, such as shrubby plants.

It would appear that this organic growth was rarely restricted to the original basin, but that, as it accumulated, it spread over adjacent land, which in time became a morass.

Evidence conclusive of this exists in the fact, that whole forests of almost every description, such as oaks, firs, ash, birch, yew, willow, &c., have been overwhelmed in its gradual but steady advancement, and are found in all positions at the bottom of peat-bogs.

Generally this formation is met with in climates of a moist nature, in level countries, where imperfect natural drainage exists; although it is found in considerable beds in upland districts.

In mountainous districts, in addition to the imperviousness of the rock to the moisture, the constant formation of clouds upon those elevated regions favors the growth of the mosses and plants, the decomposition of which contributes to the increase annually of these deposits.

In America, peat is rarely found in these elevated positions, and then only in small quantities: but in Great Britain, and on the Continent, the deposits are numerous and extensive; and, as a general thing, they are esteemed of superior quality for fuel. Instances of this kind are frequent in Ireland, Scotland, Northern Germany and Holland, while others are found high up the Alps, in the Vosges and in the Jura.

The extent and depth of the peat-bogs vary considerably in the different countries where they are found, and seem to depend upon circumstances quite distinct from each other.

It is evident that the area which they may occupy is intimately connected with the distribution of water.

Their depth in this country varies, so far as we are able to learn, from one to twenty, and, in a few instances, nearly or quite thirty feet; but an average of the depth of what may be considered our peat regions would probably be not far from five or six feet.

The morasses of Holland and Germany are, to a considerable extent, about six feet deep, as are likewise those in upland situations; while many of the peat-bogs of Ireland are from thirty to forty feet in depth; and peat-banks of solid black fuel are exposed in some localities to a corresponding height.

On intersecting these deposits, whatever their thickness, it appears, from the fact of layers of gravel, clay, shells, &c., being interposed horizontally, that, in many cases, these tracts have been swept over with currents of water more or less violent: such layers, however, are never more than a few feet in thickness, and seem to have retained all the conditions favorable for the continued growth of the plants conducive to the formation of peat.

From its physical constitution, this substance may be regarded as a kind of fossil fuel; and undoubtedly it is one of the most extensive sources of fuel known.

A writer in the "New American Cyclopædia" says, "The dense, compact peat appears to represent the first step in the progressive changes from vegetable substances to mineral coal."

Dana says, "Peat is sometimes entirely converted into coal."

Sir James Hall says, "I have always looked upon the peat of the Old World as one of the principal sources of our coal."

Dr. Macculloch, from his researches, determined that peat is intermediate between simple vegetable matter and lignite; the conversion of peat to lignite being gradual, and being brought about in a great lapse of time by the prolonged action of water.

Many bodies are detected in peat, however, which are not contained in coal; although the ultimate elements of both are the same.

Viewing it as the product of the decomposition of plants, carried on through a long succession of ages up to the present time, it is natural to expect, that, when cut vertically, differences should appear.

Mr. Williams remarks, "I have seen strata of coal that bore all imaginable marks of being composed of wood: the color, the quality, the stratification, the manner of burning, the ashes, and every thing else, looked like peat."

Dana says, "In temperate climates, it is due mainly to the growth of mosses of the genus *sphagnum*. This plant forms a loose turf, and has the peculiar property of dying at the extremity of the roots below, while it continually grows and increases above the surface; and by this process a bed of great thickness is gradually formed."

Dr. Rennie says, "No living animal exists in peat;" showing the advanc~~ing~~ed state of decomposition.

In almost every instance, this progressive change is exhibited; and, consequently, peat is classed by some authorities into *recent peat* and *older peat*, from the appearance it presents.

The former bears distinctive traces of its origin in the roots, leaves, and stems of plants, the structure of which is still retained.

It is very porous, tough, and elastic in some tracts; but in others, especially where the bog is well drained, very brittle.

The color varies, with the character of the vegetal growth, the age, and the progress of the decomposition, from a light brown to black.

The latter or "older peat," to which the preceding gradually inclines, shows few traces of fibrous matters, such as roots, stems, or leaves; but it presents, when cut, a pitchy, shining hue, and is dense and fine in the grain.

Preference has always been accorded to this as a fuel, from its superior gravity, and the greater heat which it produces when undergoing combustion.

From the change which the vegetable substances pass through, it is evident that the usual process of putrefaction is carried on in the ordinary way, at the commencement; but as the surface grows, and contact with the air is cut off, the mass is left to the play of the affinity of its elements, rendered more active by the steadily increasing pressure which it has to sustain.

The occurrence of peat is frequently indicated by the growth of dwarfish evergreens and rank swamp herbage, and by the elasticity of the crust which supports them.

Dr. Rennie remarks, "Though all peat-moss be of vegetable origin, yet the situations in which it is formed, the plants of which it is composed, and the state in which it is found, being different, it is reasonable to expect that one moss should differ from another in its appearance, qualities, and the uses to which it may be made subservient. This difference may be detected by the naked eye, whether the moss be in the pit, or dug and dried, or burning, or reduced to ashes. The various colors that substance assumes, and the external appearance of it, mark the difference. Some are of a bright yellow color; others brown, or jet black: some are composed of a congeries of vegetables in an organized state; in others, few or no traces of organization can be seen. Clay, sand, and shells may be detected in some; in others, no such mixture can be discovered. Some are soft and greasy like butter, and form a hard, brittle, tenacious peat, almost like coal; others are loose and friable like mould. The water squeezed out of one moss is of the color of amber; of another, of claret or port wine; and of a third, as black as ink. In some cases, this water effervesces with chalk; in others, not. Sometimes it leaves a copious sediment by evaporation, which is highly inflammable; in other cases the sediment is small, and scarcely inflammable. Some are covered with a rich luxuriance of aquatic plants; others are utterly bare, barren, and destitute of vegetables on their surface."

Peat meadows may be easily probed and examined by means of a pole or rod thrust through the surface, to which the peat, if present, will adhere in quantities sufficient to determine something of the character of it. A simple instrument, admirably adapted to such examinations, may be described as follows: —

Two pointed half-cylinders, of any metal sufficiently strong for the purpose, say twelve inches in length by about one or one and a half at their greatest diameter; an exterior and an interior, so arranged, that, when put together, the exterior rolls upon the interior, causing the whole to present the appearance of a conical or tapering cylinder, attached to a handle made of strong wood in lengths convenient to carry, and so arranged as to be connected at pleasure by means of proper joints. The instrument being closed, it is forced into the peat to the depth at which the examination is to be made; then, by turning the handle half round, the pressure on the exterior cylinder forces it behind the interior; and in this manner the instrument is opened. It is then forced downward about the length of the cylinder, which immediately becomes filled with the soft substance; the handle is again turned half round, which closes it, and secures the contents, which may be withdrawn and examined at pleasure.

The density of peat varies with the position in which it is found; with the organic substances from which, in different localities, it had its origin; the character and temperature of the atmosphere and climate; the proportion of earthy and mineral matters which it contains; and the thickness of the strata.

Freshly cut, it is found to be saturated with water to the extent of from thirty to ninety per cent, according to locality and density; and even when subjected to the ordinary process of air-drying, it will be found to have retained a considerable percentage of moisture for a long time, even after it has the appearance of being perfectly dry; and it will readily be understood, that, beyond a very small percentage, the amount of moisture so retained will tend to diminish very considerably the heating power of the fuel.

The degree of decomposition, however, which the substance has undergone, is supposed to determine, principally, the difference of specific weight in peat from the same cutting.

Karmarsh arrived at the following results with regard to Hanoverian peat; to wit: —

Light-colored young peat, nearly unchanged moss	0.113 to 0.263
Young brownish black peat, an earthy matrix, intersected with roots	0.240 to 0.600
Old earthy peat, without any fibrous texture	0.564 to 0.902
Old or pitch peat	0.639 to 1.039

Of twenty-seven samples of peat examined by Sir Robert Kane and Dr. W. K. Sullivan, the results, as stated in their report in 1851, show that the maximum density was 1.058; and the minimum, 0.235; a great many being under 0.600.

Similar results may be said to characterize the peat of this country, varying, as there, according to the age, location, climate, and character of the deposits.

So highly inflammable are some of the denser kinds of peat, that the characteristic distinctions of bituminized wood are considered insufficient to explain the circumstance; and hence the Ince peat of Lancashire is believed by some to be penetrated by petroleum from bituminous springs.

The ultimate elements of peat are essentially those of wood and coal; viz., — carbon, hydrogen, oxygen, and nitrogen. If, therefore, peat be distilled in close vessels, the resulting products must be those of a similar operation on coal or wood.

In this way it has been made to yield ammonia, acetic acid, pyroxylic spirit, tar, naphtha, oils, and paraffine; all of great value in the useful arts.

From numerous analyses of dried peat, by Regnault, Mulder, Kane, Sullivan, Ronalds, and others, the average of results may be stated to be about as follows: —

	MAX.	MIN.	AVERAGE.
Carbon	61.247	51.05	60
Hydrogen	6.971	5.41	6
Oxygen	35.35	30.47	33
Nitrogen	3.067	0.8070	1 = 100

Comparing these numbers with those afforded by dry wood, it would appear that an excess of ten per cent of carbon and two per cent of hydrogen is contained in the peat, over the quantity of these elements which wood ordinarily affords. This difference may have arisen from the decomposition which the matter of the peat has undergone.

In general, says Sir Humphrey Davy, one hundred parts of dry peat contain from sixty to ninety-nine parts of matter destructible by fire; and the residuum consists of earths, together with oxide of iron.

In its natural state, peat is highly antiseptic; to which may be attributed the long period which is required to elapse before the traces of the substances originating it are effaced.

This quality has been further proved by the wood which is found without being in the least injured, although buried in it to great depths for centuries. Not only these, but human bodies, and remains of animals, — the latter, in some cases, of extinct species, — and other substances prone to putrefaction, have been found at great depths in a high state of preservation.

In the Philosophical Transactions for 1757, mention is made of "a stratum of peat on each side of the Kennet, near Newbury, in Berks, which is from a quarter to a half mile in width, and many miles in length. The depth of peat is from one to eight feet; and great numbers of entire trees are found lying irregularly in it. These are chiefly oaks, alders, willows, and firs, and appear to have been torn up by the roots. Many horses' heads, and bones of several kinds of deer, the horns of the antelope, the heads and tusks of boars, and the heads of beavers, are also found embedded in it."

Peat always contains some earthy matters in greater or less proportion, according to the thickness of the stratum, and its position relative to soil in the surrounding region.

Surface peat generally contains less of mineral matter than the second and lower strata, which sometimes possess so much of these as to render it useless, in point of economy, as fuel.

In this, as well as from the nature of those matters, it differs essentially from wood.

These substances are left, when the peat is consumed by open combustion, in the form of ash; and, from the nature of the ingredients, it presents various appearances, from white to gray and ochrey-red.

The percentage of ash differs widely, as may be supposed; being reported in the statements of numerous results, to which we have had access, all the way from one to thirty-three per cent. The better qualities, however, or those which may be said to be most used, would seem to yield a quantity ranging from three to eight per cent.

The varieties yielding the largest amount of ashes are valuable as fertilizers, from the fact that they contain a large amount of phosphates, and other salts which serve to enrich the soil.

Copious details of the composition of the ashes of many of the peats of Ireland are given by Muspratt, in his "Chemistry as applied to Arts and Manufactures."

Referring to the odor emitted by burning peat, Dr. Macculloch says, "It is occasioned by an essential oil. That odor may, therefore, be useful for the lungs and head. Indeed, there is a traditional opinion among the Irish people, that those who use peat-fires are less liable to consumption than others."

Mr. Jameson, in his "Mineralogy of the Scottish Isles," remarks that peat is peculiar to cold or cool climates; and thus Nature has provided the means of a constant supply, from this source, of the necessities of the people who occupy those climates, and who continually require fuel.

As we advance toward the warmer climates, vegetable matter is more rapidly decomposed; until, at the tropical regions, the putrefaction of animal and vegetable matters is so rapid, that it prevents the formation of any body of the substance and structure of peat.

In Scotland, it is observed that the peat at the bottom of a mountain is more decomposed than that which occurs at its top, and that the lignites found in turf mosses or bogs are more sound upon the summit of a mountain than at its base.

It is also observed that the peat of the south of England is more decomposed than that of the north of Scotland, and the peat of France has more of the coaly appearance than that of England.

Prof. Lyell says, "It has seldom, if ever, been discovered within the tropics; and it rarely occurs in the valleys, even in the south of France and Spain. It abounds more and more in proportion as we advance farther from the equator, and becomes not only more frequent but more inflammable in northern latitudes; the cause of which may probably be, that the carbon and hydrogen, which are the most inflammable parts, do not readily assume the gaseous form in a cold atmosphere."

Darwin states, that, in the southern hemisphere, peat does not occur nearer to the equator than latitude 45°; that the composition there met with results from the decomposition of the plants and grasses. The fact that no mosses, so far as can be ascertained by strict examination, enter into the species of peat found in South America, favors this view.

It would be difficult to say at what period this material was first applied to its long-acknowledged useful purposes. That it was used, as it is at present, from a very early period of our history, there can be no doubt; and, in the absence of ligneous and mineral fuels especially, its great abundance, the comparative ease with which it is obtained, and singular production; arrest attention to one of those sources of comfort and convenience which an infinitely wise Creator has laid up in the storehouse of Nature for the benefit of mankind. It is clear that its value for purposes of fuel was early understood in Germany: for Pliny says expressly, that the Chaucé pressed together with their hands a kind of mossy earth, which they dried by the wind rather than by the sun; and which they used not only for cooking their food, but also for warming their bodies.

Beckmann, in his "History of Inventions," mentions a letter of sanction, by which an Abbot Ludolph, in the year 1113, permitted a nunnery near Utrecht to dig *cespites* (turf) for its own use in a part of his *vena* (turf-bog). On the same authority, we are told that the words *turba*, *turbo*, *turbæ*, and *turfa*, occur for turf in the years 1190, 1191, 1201, and 1210. The traffic in this kind of fuel is recognized in the *Leges Burgorum* of Scotland as early as about 1140. *Turbaria*, for a turf-moor, is found in the writings of Matthew Paris, who died in 1259. *Turbagium* is found in a diploma of Philip the Fair, in 1308, where its connection is such as to signify the right of digging turf. Brito, who lived about 1223, is quoted as mentioning turf among the productions of Flanders. It may be added, that words of like signification occur frequently in the earlier foundation charters of the monasteries in Germany, as conveying the right to dig turf generally within a certain limited extent of ground. Charred peat is said to have been used in the Freyberg smelting-houses about the year 1560; and mention is made of its use for like purposes in England in the early part of the seventeenth century.

Dr. King, an Irish writer, in 1685 says of turf, "It is accounted a tolerably sweet fire; and having very impolitically destroyed our wood, and not as yet found stone-coal, except in a few places, we could hardly live without some bogs. When the turf is charred, it serves to work iron, and even to make it in a bloomery or iron work. Turf charred I reckon the sweetest and wholesomest fire that can be; fitter for a chamber and for consumptive people than either wood, stone-coal, or charcoal."

METHODS OF PREPARATION FOR FUEL.

Where peat-bogs abound, and the inhabitants make use of it as fuel for domestic purposes, the process of preparation is very simple, and has varied little, if any, for ages.

The surface layer, or turf, which contains the living plants and their roots in the natural state, is stripped off to the depth of six, nine, or twelve inches.

The material is then cut with a kind of spade known as the *slane*, which has a blade about eighteen inches long by six inches broad, with a wing on the side, bent upwards at right angles to the blade, so as to form, with the latter, two sides of a square.

With this the peat is cut in long square masses, and laid upon the sward, where it spontaneously loses its water, partly by infiltration into the soil, and partly by evaporation.

After these blocks are partially dried, having been turned at intervals so as to expose the different sides to the sun and air, they are found to be reduced very materially both in size and weight, and to have acquired a good degree of consistency. They are then piled or cobbled up in heaps on the sward, care being taken to dispose them in such manner as will admit of a free circulation of air through the mass; and, after remaining exposed in this manner for some weeks, they are generally removed to some airy place of shelter, where the process of drying may continue, and the fuel be convenient of access when the season arrives for its consumption.

Such is the mode generally adopted, both in this and other countries, when the peat is of sufficient density and elasticity to bear being so handled without breaking.

When, however, the material is brittle, and will not admit of being used in this way, it is dug out with ordinary spades and shovels, and all roots, sticks, stones, and such like bodies, picked out. It is then spread upon the greensward, or, in some cases, upon suitable ground covered with a layer of straw or hay, in a mass, to the depth of eight to eighteen inches, with a breadth of about four or five feet, and to such lengths as may suit the convenience of the laborers. In this condition it is brought to a homogeneous mixture by harrowing, raking, working over with hoes, spades, or other tools, or by the treading of men or animals, until it is of about the consistency of stiff mortar, when the surface and sides are smoothed, and it is left in this state to drain and dry.

After remaining for one, two, or three days, according to the weather, and acquiring a somewhat greater degree of consistency, it is rendered still more compact by beating the surface with shovels, spades, or paddles adapted for the purpose; and in some parts of Europe this is accomplished by treading, which is there mostly done by women and children, who attach flat boards, about six inches broad and twelve to fourteen inches long, to their feet.

By this time the peat has acquired such solidity that it will bear a person's weight upon it without sinking.

The surface is then marked off, or cut by the sharp edge of a board, or a large knife adapted for the purpose, to the depth of one or two inches, into squares; the sides of which are from three to six inches, according to the size desired for the fuel when it shall have been thoroughly dried, and ready for use.

In this condition it is left to dry; and, as evaporation proceeds, the squares contract, the cuttings gradually open down to the bottom, and the mass is separated into blocks of somewhat uniform size, standing on end, and of pyramidal form; the base being still quite moist, and covering nearly the whole surface, while the top, which has been most exposed to air and sun, has contracted to nearly or quite one-quarter of its original size, and is dry and hard. The blocks are then turned once or twice, in order to give a more uniform exposure; and, at the expiration of a few days of good weather, they are in condition to be removed, and stored for use; care being taken, however, that it be in a sheltered but airy location, and that it be not too closely packed; for, notwithstanding it may have the appearance of being quite dry, it will be found to have still retained a very considerable amount of water, and, if too closely packed, is liable to a fermentative process, which injures the quality, and has been known to raise the temperature so high as to cause spontaneous combustion.

It is by a process quite similar to this, in most respects, that peat has recently been manufactured at Barnstable, Mass., which was sold in considerable quantities in Boston during the winter of 1864–5, and met with very general favor.

We copy from the "Boston Evening Transcript" of Dec. 6, 1864, the following communication concerning it: —

PEAT FUEL. *To the Editor of the Transcript. Dear Sir,* — I have observed with pleasure that the article of peat fuel was advertised in your paper; and possibly a few words in relation to it may not be without interest to your readers.

> Occasional mention has been made of it in several papers during the past season; and it is within my knowledge that considerable effort has been made in this vicinity, and in several places in the State of New York, to prepare it as a merchantable article of fuel. I think it has not yet been successfully produced and introduced into any market except this, and that not until quite recently. Your readers who travel towards the South End can see it in barrels on the sidewalk in front of Mr. Alden's coal-yard, No. 798 Washington Street, a short distance north from Dover Street. It is sold in quantities to suit, large or small.
>
> I have used it for the past two months, both at my residence and place of business, in furnace, range, and open grate; and am convinced that any who try it will be surprised, as I have been, to find how rich an article of fuel we have lying in immense quantities in the swamps about us, and capable of being produced at moderate cost. I have experimented with it in various ways, and am decidedly of opinion, that, although the process of manufacture is doubtless open to considerable improvement, the article, as at present furnished, is, in many respects, superior to coal. It ignites readily; burns freely; leaves a handsome white ash, but no clinker; gives an intense heat; and is easily managed. For open fires it is charming.
>
> Many years ago, as doubtless some of our oldest citizens will recollect, peat, in its crude, unmanufactured state, was sold in Boston in considerable quantities. It is extensively used in many places in New England, and that, too, in preference to wood, even where wood is abundant. The high price of fuel the past season has led many to seek for it; and I have heard of those who have laid in considerable quantities of it in Newton, Reading, Lynn, and in numerous places on the Cape.
>
> In many parts of Europe it constitutes the principal article of fuel for domestic purposes, and is used to some extent on locomotive-engines and in large manufacturing establishments. For the manufacture of iron and steel, it is said to be superior to any other fuel in existence. Is not the fact that abundant stores of this fuel are "on deposit" in various sections of New England worthy the attention of enterprising men? *

It was sold in large quantities at $8.50 per ton, and retailed at $9.00 per chaldron of thirty-six bushels, $1.00 per barrel, and 40 cents per bushel.

Experiments, to a limited extent, were also made with it in Boston and vicinity under stationary and locomotive boilers, with highly satisfactory results. It cannot, however, be recommended for general use for these purposes, unless solidified to a much greater extent than by this method.

Another simple process, quite common in Holland and Ireland, is to take of the mass, after being reduced to a uniform consistency, somewhat like stiff mortar, as before described, in bulk equal to the size of an ordinary brick, and by a rapid process of manipulation with the hands, easily acquired and practised, to form it into oblong blocks of somewhat uniform size and shape, which are laid upon the ground until such time as they have acquired a sufficient degree of consistency to be cobbled up, or stored for further curing and use, as in the process last before mentioned.

This is called "hand peat," and is considered somewhat preferable to either of the other kinds described.

In the "Journal of the Society of Arts" for November, 1862, was published a paper on "The Utilization of Peat," by B. H. Paul, from which we extract a few paragraphs: —

"In one case we find peat deposits in the form of what are called peat-bogs, — masses of peat of considerable superficial extent, and generally of great depth, — twenty, thirty, and sometimes upwards of a hundred feet deep.

"In the other case, we find, situated on the slopes of mountainous country, peat deposits which are never of very great depth, generally from twelve to two feet, and where the peat is sufficiently solid to be walked upon with ease. In these deposits, the peat is of a more uniform texture and character throughout than in bogs, although there is always a greater or less difference between the peat at the surface and that at the bottom. These deposits of mountain peat are very common in the Highlands of Scotland and in some parts of Ireland. Mountain peat offers very much greater facilities for cutting than bog-peat, and it is generally of much better quality; capable of taking a high polish when rubbed; and of a density greater than that of water, the cubic foot weighing from fifty-three to seventy-eight pounds.

"The method of cutting peat in the Highlands of Scotland is very different from that adopted for cutting from bogs. After removing the surface-sod, the peat-cutter, with a peculiar shaped tool, digs out the peat in slices of about a foot square, and three or four inches thick." The process of cutting and curing is given at some length, and he proceeds: "When mountain peat is cut in slices, as I have described, and spread out on the ground during dry weather, the drying goes on rapidly; the surface of the pieces acquire a kind of skin, which is not wetted again by rain; and the peat in the course of a week is sufficiently hardened to be handled. The pieces are then set up on edge, so that the air may play on both sides; and, in the course of six weeks or two months, they are dry enough to be stacked or heaped up. In the Highlands of Scotland and in the Hebrides, on the average, there is rain four days out of six; and it is only during the months of May, June, and July, that any continuance of weather favorable for drying peat can be expected. It is necessary, therefore, to obtain the utmost advantage of that period for drying; and to do so the peat must all be cut before the end of May, at latest. On the other hand, if the peat is cut during frosty weather, and becomes frozen, it crumbles to powder when the thaw comes; and for this reason it is not safe to commence the cutting at all before April, or even May. As a rule, it may be said that the month of May is the only time available for cutting peat in the Highlands of Scotland, and more especially in the Hebrides, so as, on the one hand, to avoid the destruction of the peat by frost, and, on the other hand, to insure the best possible chance of getting it dried.

"Two men working together, one cutting and one casting the peat, will, in good weather, get through what is equivalent to ten tons of dry peat; so that, if they were able to work every day during May, they would cut from two hundred to three hundred tons of peat: and, to get ten thousand tons cut and spread, one hundred men would be required for the whole month."

One essential quality of peat, in relation to its value as a fuel, is its density; and consequently numerous efforts have been made, and various processes have been attempted, by which to give it a degree of solidity equal or approximating to hard coal, and sufficient to stand the blast required for a very high degree of heat in the more severe processes of metal manufacture and steam service.

This has generally been attempted by means of direct pressure, variously applied, upon the raw material as taken from the bogs. Radical difficulties, however, stand in the way of effecting the desired condensation by any such methods, owing principally to the elastic nature of the article itself, increased to a considerable extent in all peat of a fibrous character, which causes a distention after the pressure is removed.

None of these methods have proved practically and economically successful.

We can barely allude to a few of the numerous methods by which it has been attempted to condense or solidify peat, as any extended descriptions of the various machines and processes would require space far beyond our limits.

Mr. C. M. Williams of the Cappoge Works, a gentleman who has contributed much to the development of the industrial uses of peat in Ireland, used powerful hydraulic presses, and was able to produce a fair article in considerable quantities. It is questionable, however, if, in this particular department of its manufacture, his endeavors have been remunerative.

We shall have occasion to refer to him again as we proceed with our subject.

The manner of compressing, as conducted in the Cappoge Works, was to break up the fibre of the peat as much as possible, and then to place it, interlaid with coarse cloths or cocoa matting, under the pressing machine. After remaining under pressure a sufficient time, the material was found to be reduced to one-third its original volume, and to have lost about two-fifths of its weight.

Mr. Cobbold's method is to convert the peat into a pulp, with the addition of water if necessary; after which, by means of centrifugal power applied to the mass, the water is got rid of, and a very dense product is obtained.

The course recommended by Mr. W. B. Stones, as described in his patent of March, 1850, is the use of a box divided into a number of compartments suited to the size of the machine, and pressure to be exerted upon this by rollers adapted to one another by means of leverages.

His claims covered a machine for pressing peat; a process of carbonizing; the application of carbonic-acid gas to the extinction of glowing char-peat; the employment of peat-gas produced during the operation of carbonizing, for the purpose of heating the retorts; the application of a series of receivers to the distillation of the residuum, and the obtaining products therefrom; a process of obtaining "peatole" and "peupion" by rectification; a process of obtaining "peatine;" the application of sulphur and peat to the manufacture of bisulphuret of carbon, and application of the peat and sulphur residuum to the manufacture of gunpowder; the manufacture of artificial fuel from anthracite and char-peat; the impregnation of surface peat with resin-oil, &c., for the manufacture of fire-lighters and revivers; the purification of peat-gas, as described; the obtaining of heat and light by the combustion of peat-gas in atmospheric air, when a cob or plate of platinum is employed; a peculiar construction of gas-burner, and application of these burners for the purpose of blow-pipes, &c.

At the International Exhibition of 1862, a machine was exhibited, which in the official catalogue is described as Brunton's; but it was actually the invention of Mr. Buckland, formerly of the Maesteg Iron Works, South Wales.

It consists of a solid obtuse iron cone, having a spiral groove on its exterior, and revolving vertically within a hollow cone of iron plate, perforated everywhere with small round holes just like a colander, which in fact it is. The peat is put into the space between the solid and hollow cones, and, by the revolution of the former, is forced in worm-like form through the holes in the latter.

Thus prepared, it is fashioned into bricks by any convenient machine, of which one was shown at the same place.

The bricks are artificially dried; and portions of them which were exhibited were solid and resisting.

Peat-charcoal prepared from them was also shown.

The machine is an ingenious one, and possesses some points of interest; but we do not think it can be made practically useful as a mode of manufacture. It has run several "experimental trips" in this country; and we have had repeated opportunities to see it in operation, and examine it thoroughly. The work is well done, so far as it goes. It appears to us, however, to require to be run with great care, is liable to get out of order, can do its work well only at a low rate of speed, and is equal to the production of but a small amount compared with the power required to run it, and can therefore be used satisfactorily only by parties who may desire to run it " regardless of expense."

Another method, practised to some extent in Southern Bavaria, is, after drying peat in the ordinary manner, to pulverize it by passing it through rollers; then to drive off the remaining water by heat, and consolidate the dry powder by powerful pressure.

Mr. C. Hodgson, in a paper read before the Institution of Civil Engineers of Ireland, refers to the same matter, and describes a process whereby he produces from dry powdered peat an excellent article of solid fuel. He employs for its compression an engine patented by himself, which he describes as a horizontal reciprocating ram, working in a cylinder five feet long, with a uniform bore. The powdered peat falls into this as the ram draws back at each stroke; and soon, filling the whole length, considerable friction takes place against the sides of the tube, before the frictional resistance of the column is overcome, and the whole mass moves on: so that the blocks formed at one end are successively discharged at the other, at the rate of sixty a minute; making in an hour about fifteen cwt. of compressed peat, equal in density to coal. This apparatus was recently in operation at Derrylea, near Monasterevan; and it is said by the inventor to leave no doubt of the practicability of producing dry compressed peat on a large scale, and with profit.

Messrs. Gwynne & Co. have taken out several patents for the preparation of peat-fuel. One of their processes bears some resemblances to the method last described. The peat, as dug from the bog, is deprived of much of its moisture by being placed in a large centrifugal machine; after which it is ground to powder, and passed through a series of cylinders revolving in a heated chamber, where the remaining moisture is got rid of, and the powder raised to the proper temperature for compression. It is carried from the last cylinder by pockets to the compressing tables; and, having passed through them, the solidified peat is ready for use. It is found that when the peat powder has been dried at a temperature of about 180°, and in that state allowed to enter the hopper of the compressing engine, the tarry properties of the turf are just sufficiently developed to form a good cementing compound; and the brick of compressed turf, when cold, forms a dense and very pure fuel.

These will perhaps serve to illustrate the general characteristics of an infinite number of methods proposed and machines devised for improving the quality of peat-fuel, so as to remove or overcome its characteristic fault; namely, want of density, and its treatment for other products. We shall have occasion to refer to these again, and perhaps to mention others as we proceed.

The essential points in the method of preparation of peat for fuel which has been adopted by the AMERICAN PEAT COMPANY of Boston, and which we have good reason to believe will supersede all others, are the manner of treatment of the raw material as taken from the bog, the application of moderate pressure at the proper stage of manufacture, and the manner of forming it into blocks of convenient shape and size for the various purposes for which it is to be used.

The parties interested in this enterprise have been diligently pursuing the matter during the past year, firmly convinced of the value of the article, and of the practicability of producing it in marketable shape, in large quantities, and at moderate cost; and are content that its merits as an article of fuel should stand upon the test which each consumer of fuel may choose to apply to it.

Their various inventions are secured by letters-patent, and the whole reduced to a very simple process, which can be seen in operation at their works at Lexington, Mass.

Their purpose is to encourage the manufacture of peat wherever it is found; and to this end they furnish machinery and rights under their patents, at moderate rates.

PEAT-CHARCOAL.

Not merely may we utilize peat in its natural condition, or in its manufactured and solidified state, but we may carbonize it as we do wood, and produce peat-charcoal.

The common and simple mode of carbonizing or charring the ordinary peat is in heaps, in the same manner as that of wood.

The sods or blocks must be regularly arranged, and laid as close as possible: they are the better for being large, — say fifteen inches long by six broad and deep. The heaps, built hemispherically, should be smaller in size than the heaps of wood usually are. In general, some five thousand or six thousand large sods may go to the heap, which will thus contain about fifteen hundred cubit feet. The mass must be allowed to heap more than necessary for wood; and the process requires to be very carefully attended to, from the extreme combustibility of the charcoal. The quantity of charcoal obtained by this method is generally from twenty to thirty per cent of the weight of dry turf.

For many industrial uses, however, the charcoal so produced from peat in its natural state is too light; because, generally speaking, it is only with fuel of considerable density that the most intense heat can be produced.

It is, therefore, only from peat in a solidified state that we can expect to prepare a charcoal thoroughly adapted as a fuel for the more severe processes required in the arts.

By coking this, however, a charcoal is produced of a density of 1.040 or upwards, which is far superior to the best wood charcoal, and is fully equal to that of the best coke made from coal.

Its calorific power is intense. The quality of charcoal generally obtained from a good article of solidified peat is from thirty-five to forty-two per cent of its weight.

In the great Exhibition at Paris, in 1855, numerous specimens of peat and peat-charcoal, prepared by different patented processes, were exhibited, which were remarkable for their density and cheapness, and attracted particular attention. They were stated to be economically employed for stationary steam-engines and for locomotives.

Moulded peat in small bricks, of density sufficient to sink in water, is supplied in the city of Paris from numerous sources, mostly for domestic purposes. From Liancourt, distant seventeen leagues, it is brought, and sold at the rate of twenty francs for 2,204 pounds avoirdupois. It is stated of one firm, that, in 1855, they converted some ten thousand tons or more into charcoal, obtaining from forty to forty-two per cent, which was sold at wholesale for one hundred francs the one thousand kilograms (two thousand two hundred and four pounds); which was about the same value as wood-charcoal, and about three times the price of wood and mineral coal for the same weight.

The methods adopted for charring or carbonizing peat differ somewhat in the various localities where it is prepared. We have seen descriptions of the manner in which it is conducted in England, Ireland, France, Bohemia, Bavaria, Saxony, Russia, Friesland, and elsewhere; the general principles being the same, but differing in details, some of which appear to offer decided advantages in an economical point of view, and in the production of the greatest amount of compact fuel from a given weight of the raw material.

The high heating power of peat-charcoal, and its freedom from properties deleterious to metal, must invest it with peculiar interest to the smelter, and those who follow after him as manufacturers of the article he produces; while, to the sanitary reformer and the agriculturist, its disinfecting and fertilizing qualities may be said to be of hardly less importance.

PEAT IN EUROPE.

The abundance and accessibility of peat in Ireland render it of no small importance among the natural resources of that land, especially to the vast mass of the poorer classes. It is generally of superior quality, plentiful, and cheap. Not only is it the common fuel of the poor in the interior, — and, indeed, of all classes, in some districts, — but it is transported in barges, in immense quantities, by canal, to Dublin, and there consumed by the wealthier class of the people.

So extensive is the supply of peat in Ireland, that it has been estimated to occupy one-seventh of its entire surface. It is stated that Ireland has two canals running through two million acres of peat-bog. Among other instances of the value of peat as an article of fuel, it is stated that a distillery company, by the judicious management of a bog, had their steam-power for half the cost required for coals, and were, at the same time, making an estate of reclaimed land for themselves.

The red peat-bogs, which form so remarkable a feature in this country, are chiefly comprised in the great central plain of Ireland. Unlike the English mosses, they are rarely level, but undulating; and, in Donegal, there is a bog which is completely diversified by hill and dale.

These bogs consist of moist vegetable matter, containing a great deal of stagnant water; and, after heavy rains, have been known to burst and inundate the adjoining country.

At a meeting of the British Association, in 1842, Mr. Griffith illustrated the mode in which he considered the coal measures had been formed, by describing the general condition of the peat-bogs of Ireland. They appeared to occupy basins which had formerly been lakes; but the peat-moss had grown up to the level of the water, and afterwards, by capillarity, had risen twenty or thirty feet higher. As a case in point, he mentioned a bog, the base of which consisted of clay, covered by a layer of peat which is composed of rushes and flags. Above this is another bed of peat, closely resembling cannel-coal, possessing a *conchoidal fracture, and hard enough to be worked into snuff-boxes*. It yielded twenty-five per cent of ashes, and contained a large proportion of oxide of iron.

This bed was covered with black peat, containing branches and twigs of fir, or pine, oak, yew, and hazel; only the bark being left: and, where whole trees occurred, the roots were entirely gone. The surface was formed of ordinary bog-moss (*sphagnum*), nearly white. The whole amount of peat in the bog referred to, would, he thought, form a coal-seam of at least three or four feet in thickness.

We have seen several statements, of late years, to the effect that the area of peat-land in Ireland is considerably diminished; some of the bogs having been reclaimed and converted into arable land, and others exhausted, drained, or cut out.

The Bog of Dourah, eastward from the Fergus, affords the principal supply of peat to Ennis and Clare. The bogs in this district abound in timber. A fir-tree, measuring thirty-one to thirty-eight inches in diameter by sixty-eight feet in length, is mentioned as having been raised from a bog near Kilrush. The mode of finding bog-timber is rather remarkable. It is ascertained that the dew does not lie on that portion of a bog immediately above a tree or log, as it does elsewhere. Its position can thus be easily ascertained before the dews rise in the morning; when the finder, after probing with a bog-auger to ascertain whether the wood be sound, marks the spot with a spade, and proceeds to raise the timber at his leisure. Much of this timber is sound; and from some bogs very large and exceedingly valuable sticks have been raised, the growth of past ages.

The series of extensive bogs in the central part of Ireland, though separated from each other, have received the common name of "The Bog of Allen." They vary much in depth, composition, moisture, &c. They rest, in general, upon a stratum of blue clay, based on limestone, and are invariably above the level of the sea. Their greatest elevation, however, does not exceed four hundred and ninety feet; the mean elevation being two hundred and fifty feet.

The Parliamentary Commission, appointed about 1812 to inquire into the nature and extent of the several bogs in Ireland, and the practicability of draining and cultivating them, reported, in 1814, that "the extent of peat-soil in Ireland exceeds two million eight hundred and thirty-one thousand English acres," of which there were at least one million five hundred and seventy-six thousand acres of flat red-bog, considered the most valuable; the remainder consisting of mountain-bogs, on the surface of the uplands.

The drainage and cultivation of these extensive portions of the surface of Ireland have long been regarded as objects of great national importance. Numerous commissions have been appointed to investigate and report, and frequent attempts have been made to show that these ends might be attained at no very great expense; but the instances of successful bog cultivation in any part of the island are very few, and those only under peculiar circumstances. The bogs have a value which none can question, even though they be entirely useless for purposes of cultivation. They supply the inhabitants extensively with fuel. In those parts, indeed, where bogs are scarce, they are the most valuable properties in the country. In some localities, the peat has been entirely cut out; and where this is the case, and other bogs are not easily accessible, the inhabitants have sustained great privations from the want of fuel.

It has been remarked, that "the rainy climate of Ireland, and the wet occupations of the people, together with the nature of their food, render a fire more essential to their welfare than to most others; and, in fact, it is frequently the substitute for clothing, bedding, and, in part, shelter. Had it not been for the bog, the measures taken in former times to extirpate the nation might probably have succeeded; but the bog gave them a degree of comfort upon easy terms, and enabled them to live under severe privations of another kind."

We have seen an estimate somewhat as follows, intended to show how important to Ireland are her peat-bogs in furnishing a valuable fuel, independent of her deposits of anthracite and bituminous coal.

The quantity capable of being cut for fuel may be taken as low as two million acres, at an average depth of three yards: the mass of fuel which they contain, estimated at five hundred and fifty pounds per cubic yard when dry, amounts to the enormous quantity of 6,338,666,666 tons. Taking, therefore, the value of peat as compared with that of coal (said to be as one to six), the total amount of peat fuel in Ireland is equivalent to four hundred and seventy million tons of coal; which, at twelve shillings per ton, is worth about £280,000,000 sterling, or $1,335,000,000.

In regard to the trees which are so frequently found in the Irish bogs, Mr. Aher remarks, "Such trees have generally six or seven feet of compact peat under their roots, which are found standing as they grew; evidently proving the formation of peat to have been previous to the growth of the trees." In the bogs in the vicinity of Londonderry, according to the Report of the Ordinance Survey in 1837, the fact above stated may be verified in relation to *fir-trees*, the lowest layer of which is underlaid by from three to five feet of peat. Not so, however, with *oaks*, as their stumps are commonly found resting on the gravel at the base, or on the sides of the small hillocks of gravel and sand which so often stud the surfaces of bogs, and have been aptly called "islands" by Mr. Aher, and "hummocks" by other writers. It is a remarkable fact, although very common, that successive layers of trees or stumps in the erect position in which they had grown, and furnished with all their roots, are found at distinctly different levels, and at small vertical distances from each other.

The bogs contain, it has been ascertained, two important families of trees, the resinous or coniferous trees, which grew in successive layers or tiers upon the ancient surfaces of peat; and the hard-wooded, non-resinous trees, which grew upon the gravel at the original base. Of the former, the prevailing tree was the common Scotch pine, or fir,— *Pinus sylvestris:* of the latter, the oak, *Quercus robur*, prevailed.

It may be mentioned here, as a matter of some interest, that in a " notice of a submarine forest in Cardigan Bay, North Wales," the author remarks on the occurrence therein of the *Pinus sylvestris*, although the Scotch fir is now excluded from the native flora.

With a view to ascertain its relative calorific power, Mr. C. Cowper, of London, experimented by the " litharge test," recommended by Berthier, upon peat from the Bog of Allen. This test consists in mixing a given weight of fuel with a sufficient quantity of litharge, and heating it in a crucible: the heating power is in proportion to the quantity of lead reduced. By his experiments, the following comparative results were obtained, being averages of six or eight experiments each: —

10	grains of good Newcastle coal gave	284 grains.
10	" " oven coke gave	302 "
10	" " common peat (crude) gave	144 "
10	" " same, coked in a crucible, gave	259 "

The foregoing analysis is founded upon a well-known fact, that the quantity of heat generated during the combustion of any fuel is in exact relation to the quantity of oxygen consumed in the process. Hence, in order to ascertain the relative calorific power of different kinds of fuel, it is only necessary to ascertain the quantity of oxygen which each consumes in burning.

These experiments show that seven tons of peat coke were equal to six tons of good coal coke; but the real value of the experiments and their results are very much lessened from the fact stated, and for which no reason is given, that the peat used was "of an inferior quality."

Professor Everitt conducted similar experiments, with results as follows: —

10 grains	peat coke, picked surface, gave	277 grains.
10 "	" " lower strata, gave	250 "
10 "	pressed peat gave	137 "

His investigations of the common Lancashire peat show, that, in regard to comparative specific gravity,

Compressed peat possesses	1.160
Less pressed peat possesses	.910
Peat Coke, hard pressed, possesses	1.040
Peat Coke, less pressed, possesses	.913
Charcoal, from hard woods, possesses	.400 to .625

Hence it appears that the coke prepared from compressed peat is nearly double the density of ordinary charcoal. In common practice, it has been the custom to estimate that one hundred pounds of charcoal occupy the same space as two hundred pounds of coke. Peat coke would occupy, weight for weight, the same space as common coke.

Professor Everitt adds, that, "where bulk of stowage and high intensity of heat are important considerations, the peat coke is superior to charcoal." Moreover, the density of peat coke may, by means of improvements in the mode of manufacture recently introduced, be carried up from thirty to fifty per cent beyond that indicated above; which, of course, increases the comparison in its favor.

The calorific value or power of peat coke may be commercially averaged as equal to coal coke. The evaporating powers of the two are nearly equal; but peat coke has the advantage of *freedom from sulphur*, and those conversant with the use of fuel in the manufacture of metals will readily appreciate this.

Its superiority is decided when used for the following purposes: —

For the working of malleable iron.

For melting unmalleable or cast iron.

For the smelting and general manufacture of iron from the ore; and

For all descriptions of brass and copper work.

The following table of analysis of peat, both in the raw and carbonized state, from various localities, is found in Taylor's "Statistics of Coal:" —

By whom analyzed.	Carbon, per cent.	Vaporizable matter, per cent.	Cinder, per cent.	Locality and description.
David Mushet, Esq.	25.20	72.60	2.20	Scotch Peat, raw.
Dr. Kane.	61.04	37.53	1.83	Bog of Allen, Irel'd.
M. Marcher.	65.00	22.00	13.00	Carbonized Peat.
	37.00	48.00	15.00	Raw Peat.
M. Debette.	67.00	30.00	3.00	Bohemia, carbonized.
M. Berthier.	38.00	28.00	17.40	carbonized.
	24.40	70.60	5.00	Wurtemberg, raw.
Dr. C. T. Jackson.	21.00	72.00	7.00	Maine, U.S., raw.
M. Savage.	22.00	69.70	8.30	Ardennes, France, raw.
M. Diday	9.00	58.00	33.00	Basse Alps, France, "

Professor Lyell, in his "Principles of Geology," says, —

"It is a curious and well-ascertained fact, that many of the mosses (bogs) of the North of Europe occupy the place of immense forests of pine and oak, which have, many of them, disappeared within the historical era. Such changes are brought about by the fall of trees, and the stagnation of water caused by their trunks and branches obstructing the free drainage of the atmospheric waters, and giving rise to a marsh. In a warm climate, such decayed timber would immediately be removed by insects or by putrefaction; but, in the cold temperature now prevailing in our latitudes, many examples are recorded of marshes originating in this source. Thus, in Mar Forest, in Aberdeenshire, large trunks of Scotch fir, which had fallen from age and decay, were soon immured in peat formed partly out of their perishing leaves and branches, and in part from the growth of other plants. We also learn that the overthrow of a forest by a storm, about the middle of the seventeenth century, gave rise to a peat-moss, near Lochbroom, in Ross-shire, where, in less than half a century after the fall of the trees, the inhabitants dug peat. Dr. Walker mentions a similar change, when, in the year 1756, the whole Wood of Drumlaurig was overset by the wind. Such events explain the occurrence, both in Britain and on the Continent, of mosses where the trees are all broken within two or three feet of the original surface, and where their trunks all lie in the same direction.

"Nothing is more common than the occurrence of buried trees at the bottom of the Irish peat-mosses, as also in most of those of England, France, and Holland; and they have been so often observed with parts of their trunks standing erect, and with their roots fixed to the sub-soil, that no doubt can be entertained of their having generally grown on the spot. They consist, for the most part, of the fir, the oak, and the birch. Where the sub-soil is clay, the remains of oak are the most abundant; where sand is the substratum, fir prevails.

"In the Marsh of Curragh, in the Isle of Man, vast trees are discovered standing firm on their roots, though at the depth of eighteen or twenty feet below the surface. The leaves and fruit of each species are frequently found immersed along with the parent trees; as, for example, the leaves and acorns of the oak, the cones and leaves of the fir, and the nuts of the hazel.

"The durability of pine-wood, which in the Scotch peat-mosses exceeds that of the birch and oak, is due to the great quantity of turpentine which it contains, and which is so abundant that the fir-wood from bogs is used by the country people, in parts of Scotland, in the place of candles. Such resinous plants, observes Dr. Macculloch, as fir, would produce a fatter coal than oak, because the resin itself is converted into bitumen.

"In Hatfield moss, which appears clearly to have been a forest eighteen hundred years ago, fir-trees have been found ninety feet long, and sold for masts and keels of ships: oaks have also been discovered there, above one hundred feet long. The dimensions of an oak from this moss are given in the Philosophical Transactions, No. 275, which must have been larger than any tree now existing in the British dominions.

"In the same moss of Hatfield, as well as in that of Kincardine and several others, Roman roads have been found, covered to the depth of eight feet by peat. All the coins, axes, arms, and other utensils found in British and French mosses, are also

Roman; so that a considerable portion of the European peat-bogs are evidently not more ancient than the age of Julius Cæsar: nor can any vestiges of the ancient forests described by that general, along the line of the great Roman way in Britain, be discovered, except in the ruined trunks of trees in peat.

"De Luc ascertained that the very site of the aboriginal forests of Hircinia, Semana, Ardennes, and several others, are now occupied by mosses and fens; and a great part of these changes have, with much probability, been attributed to the strict orders given by Severus, and other emperors, to destroy all the wood in the conquered provinces. Several of the British forests, however, which are now mosses, were cut at different periods by order of the English Parliament, because they harbored wolves or outlaws. Thus the Welsh woods were cut and burnt in the reign of Edward I., as were many of those in Ireland by Henry II., to prevent the natives from harboring in them and harassing his troops.

"It is curious to reflect that considerable tracts have, by these accidents, been permanently sterilized; and that, during a period when civilization has been making great progress, large areas in Europe have, by human agency, been rendered less capable of administering to the wants of man. Dr. Rennie observes with truth, that in those regions alone which the Roman eagle never reached, in the remote circles of the German Empire, in Poland and Prussia, and still more in Norway, Sweden, and the vast empire of Russia, can we see what Europe was before it yielded to the power of Rome. Desolation now reigns where stately forests of pine and oak once flourished, such as might now have supplied all the navies of Europe with timber.

"At the bottom of peat-mosses is sometimes found a cake, or 'pan' as it is termed, of oxide of iron; and the frequency of bog iron-ore is familiar to the mineralogist. The oak, which is so often found dyed black in peat, owes its color to the same metal. From what source the iron is derived is by no means obvious, since we cannot in all cases suppose that it has been precipitated from the waters of mineral springs. According to Fourcroy, there is iron in all compact wood; and it is the cause of one-twelfth part the weight of oak. The heaths (*Ericæ*) which flourish in a sandy, ferruginous soil, are said to contain more iron than any other vegetable.

"It has been suggested that iron, being soluble in acids, may be diffused through the whole mass of vegetables when they decay in a bog, and may, by its superior specific gravity, sink to the bottom, and be there precipitated, so as to form bog iron-ore; or, where there is a subsoil of sand or gravel, it may cement there into iron-stone or ferruginous conglomerate."

FRANCE.

There are several deposits of peat which furnish the supply of this material for the Paris market. A portion of a large peat-bog near Liancourt, on the Northern Railway, seventeen leagues from Paris, is wrought by Messrs. Debonne & Co., who employ about three hundred men during five months of the year. The peat here has an average thickness of about ten feet. The cuttings from the top and bottom of the bog are mixed, and, being transferred to flat-boats, is turned over with shovels, and trampled by the feet of men; after which it is moulded with pressure into the form of small bricks, which, when dried, are ready for market.

The quantity annually raised by this concern is from ten thousand to twelve thousand tons, a large portion of which is converted upon the spot into charcoal, of which the yield is from forty to forty-two per cent.

The moulded peat is worth, in Paris, about twenty francs per ton; the charcoal, about one hundred francs per ton.

This peat yields about ten per cent of ash; and the charcoal, twenty-seven per cent.

Mr. Herbert of Reims prepares a large quantity of compressed peat of excellent quality, amounting to about fourteen thousand tons annually, a part of which is manufactured into charcoal.

The peats and charcoals prepared by the patented process of Challeton at Clermont Ferrand and Montauger, specimens of which were shown at the great Exhibition of 1851, were remarkable for their density and cheapness, and attracted particular attention. They were said to be economically employed for stationary steam-engines and locomotives.

Dr. Elisha North of New London, Conn., writes in 1825: "I believe, judging from much experience, that peat of the best quality, if used for producing a genial and pleasant temperature, in common winter weather, *is the best fuel which the earth produces*, unless an exception be made in favor of a very few species of trees equally well prepared.

"My opinion respecting its utility has been confirmed by judicious and candid persons who have been practically and thoroughly acquainted with it."

He adds, "As evidence that public opinion in some places is in favor of peat, it may be mentioned that Citizen Ribaucourt published by order of the French Government, in the eleventh year of the republic, a regular treatise on the subject. In this treatise, he says ten thousand persons are annually employed in preparing and transporting peat from one peat basin or marsh upon the lesser branch of the Loire, in the north-west part of France. This peat-bed cannot be a great distance from the city Nantes, where much peat is burnt; or even from the city of Paris."

A translation of a part, and a synopsis of the remainder, of the report of Ribaucourt, referred to by Dr. North, was subsequently published in Silliman's "Journal of Science" in 1828. From this it appears that peat and its various uses had long been known in France. Its use, however, had been limited to the departments of Somme, Loire-inférieure, Pas de Calais, some cantons of the departments of Oise, Marne, Eure, Seine et Oise, Meurthe, Vosges, and to a few others. There is scarcely a valley which does not contain valuable deposits of it; the thickness varying from six inches to twenty feet.

He remarks that peat and the coal of peat may be put to the same uses as wood and charcoal, and may be advantageously employed in a great number of the arts. It is employed not only for domestic purposes, but in furnaces under boilers, in burning brick and lime, and in preparing plaster. The ashes are very valuable in agriculture, and command a high price. Observations show that the water which has penetrated peat-beds has antiseptic properties.

We find in the work of De Luc, entitled "A Letter upon Men and Mountains," some interesting details upon the progressive accumulation of peat, analogous to that of glaciers in certain mountains. There have been found under certain beds, in the Valley of the Somme, ancient causeways, divers tools, and pieces of money.

From a paper entitled "Peat as an Article of Fuel," published in Boston last year, we extract the following: —

"It is estimated, that, in France, there exists the enormous quantity of six thousand million tons of peat, purified and *dried* in the crude state; or, reduced to charcoal, two thousand six hundred and ten millions of tons; the heating power of which equals that of wood-charcoal.

"From the figures of the most skilful mining engineers in the empire, we find that —

1	kilogram of	wood-charcoal	yields	7,000	degrees of	heat.
1	"	purified peat-charcoal	"	7,000	"	"
1	"	coal coke	"	7,000	"	"
1	"	raw coal	"	5,000	"	"
1	"	raw wood	"	2,600	"	"
1	"	raw purified peat	"	4,300	"	"

while condensed peat, deprived of the excess of oxygen, possesses nearly double the heating power of coal.

"Again: it is proved that the total general annual consumption in France of all kinds of mineral and vegetable fuels was as follows: —

Wood charcoal for iron-works	667,902	tons.
" " " other purposes	472,630	"
Raw wood for iron works	8,405	"
" " " other purposes	1,989,710	"
Coal coke for iron-works	767,622	"
" " " other purposes	2,462,400	"
Raw coal for iron-works	1,108,252	"
" " " navigation, railroads, &c.	3,725,200	"
Raw and carbonized peat, actual consumption	359,319	"
Total	11,561,440	tons.

"If peat had been used in the place of these different kinds of fuel, it would have required 15,656,687 tons, raw and purified, to produce the same effect; and, at that rate, the supply of peat in France would have sufficed the empire for nine hundred years, without importing a pound of coal, and leaving her free to export annually the seven million five hundred thousand tons of coal she raised in 1862, and free likewise from the necessity of importing eight million tons of coal, as she did from England and Belgium in the same year.

"It is not believed that France is any better off in respect to her deposits of peat than the New-England States; and it is safe to say, that, by a proper development of their resources in this respect, these States could soon make themselves independent of the world, so far at least as the supply of fuel is concerned, retaining within themselves all the vast sums they annually expend for fuel, besides giving employment to and enriching their own population.

"But can peat be used at less or even the same expense as other kinds of fuel for manufacturing purposes? Take the article of pig-iron. By the French engineers, it is found that the cost of working pig-iron, —

1	ton,	with	wood charcoal, was	£4	11s	0d
1	"	"	coal coke, was	2	16s	0d
1	"	"	raw coal, was	2	15s	4d
1	"	"	purified peat-charcoal, was	2	4s	10d
1	"	"	crude peat (condensed), was	1	10s	0d"

This is enough to prove the economy of peat for *all* purposes. The general result is thus stated: "For domestic consumption, the economy — all conditions of heat being equal — would not be less than thirty per cent on the cost of fires with wood charcoal and wood, coke and raw coal; and that for large manufactories, which, on account of the quantity which they annually consume, should themselves produce this fuel, that calculation of economy would, in certain cases, be raised to sixty per cent."

Similar results follow the inquiry into the economy of using peat in locomotive engines. Of the eleven hundred and ninety-nine locomotive engines employed by four great companies of France, it was estimated that the whole ran nineteen million five hundred thousand miles per year. They used coal and coke concurrently; amounting in the aggregate to a hundred and eighty-one thousand tons, at a cost of £446,711 sterling. Purified peat would have done the same work for £271,-500; making a saving of £175,271, to say nothing of the less amount of wear and destruction of the boilers, grates, &c.

But as to bulk, does not peat require more room? "It has been proved and acknowledged, that, for equal bulk, raw purified peat contains one-third more heat than coke, and less by one-fifth only for an equal bulk of coal of good quality."

Says M. Bute, *Superintendent of Railway Engineers for the Kingdom of Hanover*, "We can, by the help of a hopper placed on the tender, carry the quantity of peat which would be necessary for a trip of one hundred to one hundred and twelve English miles. No difficulty will be presented to the employment of compressed peat for heating ordinary fixed engines, and, eventually, for that of steamboats."

On this subject, it it is sufficient to say, that, by the process employed by the "General Association for Working the Peat and Metalliferous Deposits of France," a density may be given to peat, when condensed, of from six to fifteen hundred weight per cubic yard.

These facts and conclusions have been principally obtained from reports of companies in England, and of scientific associations in France, who have studied the subject of preparing peat, both as a money-making enterprise and as an element in political economy.

ITALY.

From the reports of the great Exhibition of 1862, we quote as follows: —

"Looking at the difficulties caused by the neglect of the forests and by the want of coal, the jury were glad to award a medal to And. Gregorini of Bergamo for his successful introduction of peat in the puddling of both iron and steel. Badoni of Lecco, who was prior to him, is not an exhibiter.

"The absence of sufficient quantities of suitable fuel, and perhaps the tendency of the national tastes, keep the manufacture of iron in the Italian Peninsula at a lower point than we should expect, who remember that some of the oldest and grandest iron mines of the world are those of Elba.

"Elba produces, on the average, forty-eight thousand tons of ore, of which twenty thousand tons are smelted in Fullonica and other places in Tuscany, and yield the excellent pigs and bars exhibited by the government.

"The total amount of pig-iron produced in Italy does not exceed thirty-eight thousand tons annually."

FALKLAND ISLANDS.

These islands are destitute of coal or wood of any kind; but the lack of fuel is abundantly supplied by their extensive fields of peat, which are found in every part of the group. The deposits vary in depth from two to four feet; and it is gathered, cured, and stored, at small cost.

NEWFOUNDLAND.

Large quantities of peat, suitable for fuel, exist on this island. It is stated on good authority, that beneath its surface occur the trunks and roots of trees much larger than any which are now growing on the island.

NOVA SCOTIA.

Peat swamps and bogs are very numerous in Nova Scotia, especially in the rocky districts of the Atlantic coast. The most extensive are said to be near the Clyde River in Shelburne and the Carriboo Bog of Aylesford. They consist of vegetable matter which has grown and accumulated on the spot, forming a black carbonaceous moss, some of which has entered on the first stage of the changes by which it may be converted into coal; and it is not unusual to find in the bottom of such bogs a substance much resembling ordinary bituminous coal.

On the north-west arm of the River of Inhabitants, appears, under twenty feet of bowlder clay, a hardened bed of peat. It rests upon gray clay similar to that which often underlies peat-beds.

Pressure has rendered this peat nearly as hard as coal; though it is somewhat tougher and more earthy than good coal. It has a glossy appearance when rubbed or scratched with a knife, burns with considerable flame, and approaches in its character to the brown coals or more imperfect varieties of bituminous coal. It contains many small roots and branches, apparently of coniferous trees allied to the spruces.

CANADA.

Numerous and extensive deposits of peat are met with in various parts of Eastern Canada, which seems to present conditions of soil and climate peculiarly favorable to its growth and accumulation. The peat bogs, so far as known, are chiefly confined to the plains along the St. Lawrence and its tributaries, and appear to have been formed in shallow lakes, which have been gradually filled up by the growth and decomposition of mosses. The peat often rests upon a layer of shell marl, which at one time formed the bottom of the lake. From the recent elaborate Report on the Geolgical Survey of Canada, made by Sir William E. Logan, Alexander Murray, Esq., T. Sterry Hunt, and E. Billings, we are enabled to mention the principal deposits of peat which are as yet known in Canada.

It is to be remarked, that, with the exception of a partial trial made of the peat near Chambly, none of these deposits have ever yet been worked; and that it is only in a few localities that the thickness of the peat has been determined by pits or by borings.

Beginning to the westward, a deposit of peat occurs on the twelfth lot of the fourth and fifth ranges of Sheffield, where it overlies a bed of marl, and extends over three or four hundred acres. The average thickness of the peat is about four feet, and it is said to be of a superior quality. In the level region between the St. Lawrence and Ottawa Rivers, several large peat-bogs occur; but, from their nature, the vicinity has been avoided by settlers, and they are, therefore, difficult of access. There is said to be a considerable area of peat in the rear of the seigniories of Vaudreuil and Rigaud; and also in Caledonia, where its thickness does not appear to exceed three or four feet. Peat occurs at the sources of the Pain River in Roxburg, Osnabruck, and Finch; and also in Clarence, Cumberland, and Gloucester.

In the third, fourth, and fifth ranges of the latter township, is a tract known as the Mer Bleue, which consists of two long peat-bogs, separated by a narrow ridge of higher land, and occupying each about two thousand five hundred acres. These deposits were sounded in many places, with a rod, to a depth of twenty-one feet, without finding bottom: in other parts, the peat was from eight to fifteen feet in thickness. This tract is situated only three miles from the Ottawa, and is about two hundred and eighty feet above the level of the sea. Three large areas of peat, of from one hundred to three hundred acres each, occur in Nepean and Goulbourn; one of them to the east, and two to the west, of the village of Richmond. It is also found on the third and eighth ranges of Beckwick, to the east of Mississippi Lake; and an area of about three thousand acres of peat occurs in Westmeath, in the rear of front A, and from the first to the fifth range behind it. In the ninth and tenth ranges of Huntley, there are about two thousand five hundred acres of peat, which in some parts has a thickness of eight or ten feet; while in other parts no bottom is found at a depth of fifteen feet. It is probable that peat may be met with in many other localities throughout this region.

On the north side of the Ottawa, three small areas of peat have been observed in Grenville. One of these, on the fourth and fifth lots, covers about thirty-six acres, and has a depth of ten feet. It has been used in the neighborhood, and is pronounced of excellent quality. Another deposit of about the same extent occurs on the first lot of the same range, and is in some parts more than fifteen feet in thickness. A third, of about thirty acres, occurs on the fourth lot of the seventh range. On the fourth and fifth lots of the first range of Harrington is a bog of about forty acres, the peat of which varies in depth from ten to twenty-five feet. Another bog is described as occurrign on the first and second lots of the fifth range of the same township. It extends over about sixty acres, and has a thickness, in some parts, of twenty-five feet. All of these areas might be drained without much difficulty. To the eastward of this, a peat-bog is met with in the Rang Double of Mille-Iles. It exhibits a breadth, on the road from St. Janvier to St. Jerome, of about half a mile, and has an area of perhaps five-eighths of a square mile. Its depth along the road was found to be, in several places, from two to eighteen feet, the greater depth being towards the south-east side; and its average may be taken at eight feet. A smaller deposit of peat occurs half a mile nearer to St. Janvier: it has a breadth of about a quarter of a mile, but its superficies and depth have not been ascertained. Upon the same great plain with these, a little to the north of the Church of St. Anne des Plaines, and on the north-east side of the road leading to New Glasgow, is a peat bog, having an area of about a square mile. Its depth was not determined; but it is supposed to average about five feet. The farmers are in the habit of burning the surface of parts of this bog, and employing the ashes as a manure for the underlying portions, until by repeated burnings they reach the subjacent clay, which, mingled with the last thin layer of peat and a portion of the ash, constitutes a very fruitful soil.

Near the front of the seigniories of Assumption and St. Sulpice, there is a peat bog, three and a half miles in length, with an average breadth of half a mile, giving an area of about eleven hundred acres. Its depth varies from two to fifteen feet; and the result of ten trials, made in two lines across the bog, gave an average of ten feet. In the seigniories of Lavaltrie and Lanoraye, there are two extensive peat bogs, running parallel with each other. Of these the northern is the larger, and is known as the Grande Savanne. It has a length of about eight miles from north-east to south-west, and a breadth of from half a mile to two miles and a half, covering a superficies of from twelve to fifteen square miles. Two sections were made across this bog; one on the line of the railway between Lanoraye and Industry, which traverses it about three miles from its south-west extremity. It here reaches to within four miles of the St. Lawrence, and has a breadth of two and a half miles. The depth along this line was found to be from four to fourteen feet; the average of twelve trials giving about eleven feet. The other section, along the Lavaltrie Road, about four miles to the north-east, gave a breadth of half a mile, and a depth of from seven to fourteen feet; averaging, as before, eleven feet. The smaller of these bogs lies between that just described and the St. Lawrence, at a distance from the last of about two miles. On the line of the railway it has a breadth of over half a mile, and an average thickness of about five feet. It has a length of more than five miles, extending four and a half miles to the south-west of the railway, and a superficies of about three square miles.

In the fief of St. Etienne, about a mile and three-quarters south-west of the Grès, on the St. Maurice River, the main road crosses a peat bog, which is there half a mile in breadth, with an average depth of about six feet. Its extent to the north-east and south-west has not been ascertained. Another was met with in the seigniory of Champlain, about three miles from the St. Lawrence, and on the road from the church to the River Champlain. Its breadth on the road is about three-quarters of a mile; and its average depth, in this part, five feet. Its length from north-east to south-west appears to be about two miles, giving to the bog an area of about a mile and three-quarters. In the fief D'Auteuil, on the road between Cap Santé and the village of L'Enfant Jésus, there is a peat bog, with a breadth of about a quarter of a mile, which has not been farther examined. Several other peat bogs are known to exist between this last locality and the vicinity of Quebec.

On the south side of the St. Lawrence, there is a large area occupied by peat on the west side of the River Richelieu. It covers portions of the seigniories De Léry and Lacolle, and of the townships of Sherrington and Hemmingford, embracing perhaps fifteen or twenty square miles. This area is drained in part by the Lacolle River. It has not been carefully examined as yet; but it contains in some parts, particularly, it is said, in Sherrington, a very great thickness of peat. Of two specimens from this township, one, which was dark colored, fine grained, compact, and so heavy as to sink in water, gave only 3.53 per cent of ash; while the lighter peat, from near the surface of the bog, yielded 4.66 per cent of ash. Both of these are very pure; and the compact peat, which is remarkable from its great density and its freedom from earthy matters, is particularly worthy of attention.

A large peat bog occurs in the seigniory of Longueuil, on the road to Chambly; and an attempt was made, a few years since, to raise the peat, and introduce it to the Montreal market. A peat bog of large size is found in the seigniory of Ste. Marie de Monnoir; and another in the parish of St. Dominique, including parts of Ste. Rosalie and St. Pie. Its dimensions may be five or six miles in one direction by three or four in another. This extent is covered by a layer of peat, which, from two or three feet at the edges, attains a depth of six feet, and in some parts, it is said, is eighteen feet in thickness. The bog has been partially drained, and portions of the land reclaimed for agricultural purposes. The drained land, being first cleared of trees, is ploughed, and then, in the dry season, set on fire. In this way, eight or ten inches of peat are burned, leaving an ash which serves as manure, and enables the surface to yield one or two crops of barley or oats. After two years, the soil becomes exhausted, and it requires to be again burned over to render it productive. When, by several repetitions of the process, the peat has been reduced to a few inches, the remaining portion is mingled, by ploughing, with the underlying clay, and a rich, mellow soil is obtained. The peat from this bog yields, when heated in close vessels, about thirty-six per cent of coke, and contains from six to seven per cent of ash.

In the seigniory of Rivière Ouellé, there is a peat bog which covers about four thousand acres; and another one occurs in the seigniory of Rivière du Loup, having a superficies of six thousand acres. Its breadth, on the Temiscouata Road, is a mile and a quarter; and its depth in some parts has been ascertained to be eighteen feet. Peat is found in abundance on the first and second concessions of the seigniory of Ile Verte; and, from a point two miles below the Rimouski, there is a belt of peat bog extending nearly all the way to the Métis River, a length of over twenty miles. Its distance from the St. Lawrence is from a quarter to half a mile, and its breadth from a quarter of a mile to a mile. The depth of the deposit, where observed, was from one to six feet. To the east of the Rimouski River there is a peat bog, which has a length of three or four miles, in the townships of Duquesne and Macpes; with a breadth of about three-quarters of a mile, and a thickness which was found to be from five to twelve feet: it is said to be in one place thirty feet in depth. Another locality of peat is stated to be in the townships of Matanne and Macnider, between the

Rivers Blanche and Matanne. A peat bog of about one hundred acres occurs on the left bank of the Madawaska, just above the twelfth mile-post on the road to the Little Falls.

The most extensive peat deposits in Canada are found on Anticosti. Along the low lands on the south coast of the island, from Heath Point to within eight or nine miles of South-west Point, a continuous plain, covered with peat, extends for upwards of eighty miles, with an average breadth of two miles; thus giving a superficies of more than one hundred and sixty square miles. The thickness of the peat, as observed on the coast, was from three to ten feet; and it appears to be of an excellent quality. The height of this plain may be, on an average, fifteen feet above high-water mark; and it could be easily drained and worked. Between South-west Point and the west end of the island, there are many smaller peat bogs, varying in superficies from one hundred to one thousand acres. In the vicinity of Port Daniel, in the Gaspé District, extensive deposits of peat are found.

The vegetation consists, for the most part, of mosses belonging to the genus *Sphagnum*. Besides these, however, the bogs often support a growth of tamarack and of various ericaceous plants. The leaves, roots, and stems of these, help, with the moss, to make up the peat. The peat near the surface consists of the moss but little altered, and is very soft and porous; but in the older and deeper portions of the deposit it is more dense, and darker in color, the vegetable tissue having undergone a partial decay, by which its fibrous structure, to a greater or less degree, disappears, and the substance assumes a more cheese-like texture.

The various shell marls which are often associated with the peat deposits in Canada, have, in all cases where they have been examined, proved to be nearly pure carbonate of lime.

MAINE.

Dr. C. T. Jackson, in his geological survey of this State, directed attention to the numerous valuable deposits, or rather accumulations, of peat.

At the localities which he designates, this substance may be most advantageously wrought for fuel. It is said by him to be found at the depth of three feet from the surface, amid the remains of rotten logs and beaver sticks; showing that it belongs to the recent epoch. Some of the deposits are twenty feet in thickness, resting upon white siliceous sand.

In one instance, coal is stated to have been found while digging a ditch to drain a bog. He says, "On examination, I found that it was formed from the bark of some tree allied to the American fir, the structure of which may be readily discovered by polishing sections of the coal, so that they may be examined by the microscope." His analysis shows that it contains —

Bitumen	72
Carbon	21
Oxide of Iron	4
Silica	1
Ox. Manganese	2
	100

"This substance is, therefore, a true bituminous coal, remarkable indeed for containing more bitumen than is found in any other coal known. I suppose it to have been formed by the chemical changes supervening upon fir balsam during its long immersion in the humid peat."

This is a very interesting discovery; and the same substance appears to exist in other peat bogs of the State.

The same author notices the accumulation of peat at Quaddy Head, near the south-east angle of the State. This deposit is fifteen feet in thickness, and is of an excellent quality for fuel.

"The time may arrive, when even in Maine, wood becoming scarce, her neglected peat bogs will be resorted to for fuel; though here as in many other sections, were the *superiority* of the article over even wood or coal known and appreciated, the bogs would be worked now rather than to await the period at which, for lack of other fuel, their valuable deposits shall be drawn upon."

Dr. Jackson adds, "There are so many localities of peat in Maine, that I have thought it hardly necessary to describe them, but would, however, point out localities on the railroad route in Bangor, at Bluehill, near the Marsh Quarry in Thomaston, in the town of Limerick, and on the Coolidge Farm in Waterford. These localities are among the most abundant, and may be most advantageously wrought for fuel, which may be used for the burning of lime and for domestic purposes." Valuable deposits are said to exist also in the vicinity of Portland.

NEW HAMPSHIRE.

We are of opinion that it is used but very little in this State as an article of fuel; though, as an important ingredient in forming a compost, it is extensively used, and its value recognized. Deposits are numerous, and in a few places are known to be of excellent quality for fuel; as in Meredith, Canterbury, Rochester, and Franconia, especially the three former. Valuable deposits are also found in Northumberland and vicinity, Whitefield, Littleton, Dublin, Warner, Franklin, Kingston, Lancaster, Lyndeborough, and other localities.

VERMONT.

The Report on the Geology of Vermont, by Professors Hitchcock and Mr. A. D. Hagar, contains many items of interest concerning peat, from which we extract most of what follows.

Peat-beds may be found in every town in the State. The number is so great, that we shall not endeavor to enumerate them all. We will, however, mention some of special interest, mostly from the observations of Rev. S. R. Hall.

The peat throughout the State, it is thought, will average about five feet in thickness, and is in many places covered with a growth of timber consisting of cedar, black ash, tamarack, spruce, and pine.

In Albany, on the farm of Zuar Rowell, east of Great Hosmer's Pond, overlying marl, is a bed of peat four feet thick, covering from six to ten acres. It is computed that each acre contains about one thousand five hundred cords of peat.

On the land of G. W. Powers, in the south-east part of the town, half a mile north, upon Mr. Orne's farm, in the north-east part of the town, on land of Mr. Church, Mr. Hovey, and others, there is a large amount of peat. Near the new church there is a bed of peat, evolving sulphuretted hydrogen when disturbed.

Peat is also described as abundant in the towns of Andover, Barnet, Barre, Barton, Berlin, Bethel, Bradford, Brattleborough, Bridgewater, Brookfield, Brownington, Calais, Cavendish, Chelsea, Chester, Corinth, Coventry, Craftsbury, Danville, Derby, Dummerston, Eden, Elmore, Glorr, Greensborough, Hancock, Hardwick, Hartford, Holland, Hydepark, Jamaica, Londonderry, Lowell, Ludlow, Marshfield, Montpelier, Moretown, Morristown, Newfane, Norwich, Peacham, Plymouth, Putney, Pownal, Randolph, Rochester, Rockingham, Royalton, Ryegate, St. Johnsbury, Springfield, Thetford, Townshend, Troy, Waitsfield, Walden, Wardsborough, Warren, Washington, Waterbury, Waterford, Weathersfield, Westminster, Westmore, Williamstown, Windsor, Woodbury, Woodstock, Wolcott, and Worcester. If particulars concerning these beds are desired, they will be found described as *muck* in the Second Geological Report of Professor Adams.

Numerous, and in some cases very valuable, beds of marl are disposed in all parts of the State; and the remark is made, that most of them are associated with beds of peat and other forms of organic vegetable matter.

Many of the peat-beds are observed to occur in meadows formerly the haunts of beaver; and numerous traces of the works of these busy little animals are discovered as excavations are made.

It is an interesting fact, that one of the most remarkable fossils ever found in New England was discovered in a peat-bed in Vermont, on the line of the Rutland and Burlington Railroad.

We allude to the remains of an elephant which were found in Mount Holly in 1848. The following is Professor Thompson's description of it: —

"The Rutland and Burlington Railroad crosses the Green Mountains, in the township of Mount Holly, at an elevation of one thousand four hundred and fifteen feet above the level of the ocean; and the bones of the fossil elephant were found at that height. It was in a peat-bed, east of the summit station, that these bones were found. The basin in which the peat is situated appears to have been originally filled with water, and to have been a resort for beaver; a large proportion of the materials which formed the lower part of the peat consisting of billets of wood about eighteen inches long, which had been cut off at both ends, drawn into the water, and divested of the bark, by the beaver, for food. The peat was fifteen feet deep before the excavation for the railroad was made.

"In making this excavation, the workmen found, at the bottom of the bed, resting upon gravel, which separated it from the rock below, a huge tooth. The depth of the peat at that place was eleven feet. Soon afterwards, one of the tusks was found, about eighty feet from the place of the tooth above mentioned, which was a grinder. Subsequently, the other tusk and several of the other bones of the animal were found near the same place. These bones and teeth were submitted to the inspection of Professor Agassiz, who pronounced them to be an extinct species of elephant.

"The grinder is in an excellent state of preservation, and weighed eight pounds; and the length of its grinding surface is about eight inches. The tusks are somewhat decayed, and one of them badly broken. A cord drawn in a straight line from the base to the point of the most perfect tusk measures sixty inches; and the longest perpendicular, let fall from that to the inner curve of the tusk, measures nineteen inches. The length of the tusk, measured along the curve on the outer surface, is eighty inches, and its greatest circumference twelve inches. The circumference has diminished very much since the tusk was taken from the peat-bed, on account of shrinkage in drying; and several longitudinal cracks have been found in it, extending through its whole length; and it was found necessary to wind it with wire, to prevent it from splitting to pieces."

In 1858, the remains of another elephant were found in Richmond, which are now in the cabinet of Vermont University.

Rev. S. R. Hall, in his Report on the Geology of Vermont, says, "Nearly all the peat or muck of Vermont would answer a good purpose for fuel; but at present it is not needed. It would furnish an abundance of carburetted hydrogen, if employed for producing *gaslight*, much less expensive than coal, oil, or resin. 'The gas is harmless, inoffensive; and has, in respect to healthfulness, great advantages over some other kinds.' "

On the summit of Mansfield Mountain, in the town of Stowe, the highest point in the State, 4,348 feet, are found beds of peat and the *sphagnous mass* that produces them. This is one of the very few cases in New England where peat occurs at great elevation. In Europe the cases are numerous.

MASSACHUSETTS.

In his Report on the Geology of Massachusetts, Dr. Hitchcock says, " Taking the State as a whole, peat is but little used, either as fuel or manure ; yet for both purposes its use is rapidly increasing, especially in the eastern part of the State, where fuel is more expensive. In view of its importance, I have made some efforts to ascertain its probable amount in our swamps. But this is very difficult; both because our swamps where it occurs have been but slightly explored, and because much is called merely mud that deserves the name of peat."

He then proceeds to enumerate various localities where it is known to exist, and gives data for forming an approximate estimate of the amount of this deposit in the State ; and adds, " It will be seen that scarcely any towns in the four western counties of the State are mentioned. This is partly explained by the fact that fuel is more plenty there than in the eastern counties, so that public attention has never been directed so much to our fossil resources. But I think it undeniable, that the amount of good peat in the western counties is much less than in the eastern.

" Although, perhaps, the swamps abound as much in vegetable matter that would be useful in agriculture, yet it does not seem to be converted into genuine peat ; though I do not doubt that it will be easy to find a large amount of it when there is a demand for it.

" Excluding these western counties, and taking the amount of peat given in the statements made to me as a fair average of its quantity in all the towns of the other counties (excluding the large towns), it would follow that eighty thousand acres, or one hundred and twenty-five square miles, are covered with peat in that portion of the State, having an average thickness of six feet four inches. This area and depth would yield not far from one hundred and twenty-one million of cords.

"If this should be thought by any to exceed the quantity of good peat existing in that section, I presume no one will consider it too high an estimate of the amount of swamps filled with vegetable matter. I presume it falls far short of the true amount.

"We hence get an enlarged view of the quantity of matter in the State that may be employed as fuel, or in agriculture, that has hitherto, except in some limited districts, remained almost untouched.

"It is true that peat is not so convenient and agreeable a kind of fuel as good wood or coal; yet it certainly answers a very good purpose; and the facts in the case tend to allay the apprehension which must sometimes rise in the mind of one who sees in the gradual diminution of our forests a future check to our prosperity and population.

"It is gratifying to learn from so many towns that the inhabitants are awaking so much to the use of peat and peaty matter. Some gentlemen have even spoken of it as a 'peat fever.' I hope it has not yet reached its crisis."

Recent personal experience, and considerable intercourse with numerous persons who have during the past season used *solidified* peat as fuel, convinces us that Dr. Hitchcock underestimated the convenience and agreeableness of peat as compared with "good wood or coal." We consider it preferable by far to either, in many respects. He doubtless referred to the crude, unmanufactured article.

The following list of towns where peat is known to exist includes those mentioned by Dr. Hitchcock, and others of which we have personal knowledge:—

Abington,
Acton,
Amesbury,
Andover,
Athol,
Barnstable,
Bedford,
Bellingham,
Bernardston,
Billerica,
Boylston,
Brewster,
Bridgewater,
Buckland,
Carver,
Chelmsford,
Chilmark,
Cohasset,
Concord,
Cambridge,
Danvers,
Dennis,
Dighton,
Dover,
Duxbury,
Eastham,
Falmouth,
Framingham,

Greenfield,
Groton,
Hadley,
Halifax,
Hanover,
Hanson,
Hamilton,
Hingham,
Holden,
Hopkinton,
Ipswich,
Kingston,
Lancaster,
Leverett,
Lexington,
Longmeadow,
Ludlow,
Lunenburg,
Lynnfield,
Medway,
Methuen,
Millbury,
Medfield,
Milton,
Nantucket,
Natick,
Needham,
Newton,
Northborough,
Orleans,
Oxford,
Pittsfield,
Randolph,
Reading,
Rowley,
Roxbury,
Southborough,
South Reading,
Seekonk,
Sharon,
Shrewsbury,
Spencer,
Sudbury,
Sunderland,
Shutesbury,
Stoughton,
Tisbury,
Topsfield,
Truro,
Uxbridge,
Waltham,
Walpole,
Wales & Holland,
Watertown,
Wellfleet,
Weston,
Westford,
Wilmington,
Wrentham,
Yarmouth.

In his "Geology of Massachusetts," 1833, Dr. Hitchcock says of peat, "There are two varieties, the fibrous and the compact. In the former, the moss, turf, and roots, out of which peat is formed, have not lost their fibrous structure; but in the latter they are converted into a compact and nearly homogeneous mass.

"The fibrous and compact varieties probably exist at nearly every locality.

"I am sure of their occurrence in Cambridge, Newton, and Lexington; and in large quantities. Peat is abundant in Seekonk, Uxbridge, Cohasset, Duxbury, Hingham, Medfield, Walpole, Wrentham, Dover, Framingham, Sudbury, Topsfield, Ipswich, and Nantucket.

"It exists and has been dug, in greater or less quantities, in Pittsfield, Hadley, Leverett, Shrewsbury, Lancaster, Southborough, Hopkinton, Medway, Halifax, Stoughton, Boylston, Reading, Milton, Needham, Concord, Billerica, Bedford, Waltham, Watertown, Acton, Wilmington, Danvers, Chelmsford, Hamilton, and in nearly all the towns in Barnstable County; certainly in Yarmouth, Brewster, Orleans, Eastham, Wellfleet, and Truro.

"I cannot but regard the existence of so large quantities of peat on Cape Cod and Nantucket as a great blessing to the inhabitants; yet, from the little of it which I observe to be dug there, I am apprehensive they do not realize its value.

"Not a town in the State can be named where more or less peat does not exist. The eastern section, however, is certainly best stored with those varieties that may be employed for fuel; and it is an unexpected fact, that the south-east part of the State, which abounds with sand, contains also a large amount of peat.

"The beds of peat on Nantucket, and the small adjacent Islands of Thuckanuck, Muskegut, and Gravel, contain, according to a report of Lieut. Prescott, six hundred and fifty acres of peat from one to fourteen feet thick, and generally of good quality. This must afford an inexhaustible supply of fuel for the inhabitants; and yet I was surprised to learn that so little use was made of it."

We are told of a deposit of peat at Barnstable, resting upon a thick bed or matting of cranberry vines; the vines and berries still preserving their original form until brought to the surface and exposed to the sun and air.

We have ourselves seen at Lexington, Mass., a rich deposit of pure black peat, six feet in depth, resting upon a compact bed of clean moss, of the consistency of wet hay, and retaining its light green color.

It is a curious fact also, and worthy of note, that, along the coast in the south-east part of the State, the remains of ancient forests, now submerged, are not uncommon.

This is the case in the harbor of Nantucket, as reported by Lieut. Jona. Prescott, who superintended the dredging of that harbor. Portions of cedar, maple, oak, and beach trees, were found, some of them in an erect position, accompanied by peat. Another submarine forest exists at Holmes Hole. Near the south-west extremity of the Vineyard, we learn of another. On the north side of Cape Cod also, opposite Yarmouth, cedar stumps are found, extending more than three miles into Barnstable Bay. The same thing is said to occur in the bay of Provincetown, on the side opposite the village.

Professor Lyell, in his second visit to the United States, mentions a submerged forest "at Hampton, on the way from Boston to Portsmouth," also one near Portsmouth, N.H., "now submerged at low water, containing the roots and upright stools of the white cedar, showing that an ancient forest must once have extended farther seaward." In his first visit to North America, he mentions a submerged forest, somewhat similar, near Fort Cumberland, in Nova Scotia. He records other observations in relation to submerged trees at the mouth of Cooper River, near Charleston, S.C., and of the Altamaha, in Georgia.

A letter from Elias Phinney, Esq., of Lexington, dated Jan. 30, 1839, and addressed to Dr. C. T. Jackson, upon the subject of peat, has been many times referred to, and so often quoted that it may be regarded as authority. It will be found copied entire in the Report of the New-York Survey, submitted by Dr. W. W. Mather, in December, 1839; and in the Geological and Agricultural Report of Rhode Island, 1840.

A few extracts from it will be of interest here: "I consider my peat grounds by far the most valuable part of my farm; more valuable than my wood-lots for fuel, and more than double the value of an equal number of acres of my uplands for purposes of cultivation.

"In the first place, they are valuable for fuel. I have, for twenty years past, resorted to my peat meadows for fuel. It gives a summer-like atmosphere, and lights a room better than a wood fire. The smoke from peat has no irritating effect upon the eyes, and does not, in the slightest degree, obstruct respiration, like the smoke of wood; and it has none of that drying, unpleasant effect of a coal fire. The ashes of peat are not more troublesome, and are less injurious to the furniture of a room, than the ashes of coal.

"The best peat is found in meadows which have for many years been destitute of trees and brush, and well drained, and where the surface has become so dry, and the accumulation of decayed vegetable matter so great, that but little grass or herbage of any description is seen upon the surface.

"A rod square, cut two splittings deep, each splitting of the length of eighteen inches, will give three cords when dried. It may be cut from May to September. If the weather in autumn be very dry, the best time for cutting will be from the middle of August to the middle of September. If cut in the latter part of summer or early in autumn, it dries more gradually, and is not so liable to crack and crumble as when cut early in summer. It is considered a day's work for a man, a boy, and a horse, to cut out and spread a rod square. It will require about four weeks of dry weather to render it fit to be housed for use.

"Peat taken from land which has been many years drained, when dried, is nearly as heavy as oak-wood, and bears about the same price in the market."

As early as 1815, the subject of peat as an article of fuel was by some considered of so much importance, that Dr. Aaron Dexter, President of the Massachusetts Agricultural Society, submitted to the trustees a paper which he had prepared upon the subject, being an abridgment of a work in two volumes, by Dr. Robert Rennie, of Kilsyth, in Scotland, accompanied by some remarks upon the valuable deposits in our own State, and the importance of improving them. The paper was published; and from it we make the following disconnected extracts: —

"Peat-water possesses astringent, antiseptic qualities. Rain or river water, when allowed to stagnate, especially in warm weather, becomes putrid: peat-water does not.

"Rosier observes that the air of peat mosses is always salubrious; that, by a wonderful provision of Nature, oxygen is exhaled, and hydrogen absorbed; and, by reason of the low temperature of the moss, carbonic acid is not evolved, so that by this means the air is never infected with these deleterious gases.

"Carr, in his 'Stranger in Ireland,' mentions that this is the case in that country. Dr. Walker makes a similar remark. He says, 'Stagnant rain-water, especially in warm weather, occasions, in fenny countries, intermittent fevers and putrid diseases, whereas no such effects are felt from stagnant moss water.' The moors and mosses in Scotland, and the turf-bogs in Ireland, are inhabited by as healthy people as any in the world. No intermittent fevers, no putrid sore throats, prevail among them. M. de Luc makes the same remark. He says, 'Over the whole continent of Europe, which I examined, the air of the mosses, even in the lowest valleys, is very salubrious. The inhabitants of these districts are remarkably healthy: they are not liable to the fever and ague which prevails in other low level lands in their immediate vicinity, where there are no mosses.' The oxygen they discharge must purify the air, and promote the health of those who inhabit such districts.

"Some peat, when dug, becomes so hard, so heavy, and so glossy in the fracture, that it is with difficulty it can be distinguished from some of the softer coals. On the contrary, Mr. Williams says that he has seen coal so soft, that it was with difficulty it could be distinguished from the hard, black, glossy peat.

"There are the strongest reasons for supposing that all coal has been at one period of its formation in a soft, pulpy state, like the above species of peat when newly dug; that coal, wherever it has been discovered, has certainly been exposed to a degree of mechanical pressure far beyond that which was ever applied to peat by art. It would be superfluous to offer any proof of this; and, if the best peat was subjected to the same degree of compression, it is obvious that it would become equally compact and equally heavy, bulk for bulk, and equally as inflammable as coal; in no respect distinguishable from that substance, in color, consistency, or chemical qualities. The external appearance of coal shows its alliance to peat, in color and consistency: the resemblance is often clear."

RHODE ISLAND.

Dr. Jackson, in his Report on the Geological and Agricultural Survey of this State, says, "Peat and swamp muck occur in almost every town in the State;" and goes on at considerable length to give his views in regard to the value of both, the former as fuel, and both as fertilizers.

He mentions the following localities in which peat of excellent quality for fuel is found, as shown by analysis, statements of which are incorporated in his report: —

Cranston,
Cumberland,
Wickford,
Pawtuxet,
Warwick,
Woonsocket,
Block Island,
North Kingston,
South Kingston,
Bristol.

We also learn of extensive deposits, of excellent quality, in the immediate vicinity of Providence.

CONNECTICUT.

Extensive deposits of peat are said to exist in some parts of this State; but we have not been able to gather particulars.

NEW YORK.

In the several Geological Reports of this State, made by Professor Mather, Mr. Vanuxem, and Dr. Emmons, special mention is made of the rich deposits of peat, and the certainty, that, sooner or later, they will undoubtedly prove to be of great value for the production of fuel.

A great number of localities are indicated, and estimates made of the amount of peat "on deposit."

Dr. Emmons furnishes some particulars of peat within his district, points out the high economical value which he considers must attach to it as a combustible, and says, "Perhaps it would be saying too much to assert that peat is more valuable than coal: but when we consider, that, for creating heat, it is not very inferior to bituminous coal; that it contains a gaseous matter equal in illuminating power to oil or coal-gas; that its production is equally cheap; and, in addition to this, that it is a valuable manure if properly prepared,—its real and intrinsic worth cannot fall far short of the poorer kinds of coal."

It should be borne in mind that these remarks refer to the article in its crude, unmanufactured state. It will, we anticipate, be found, that the *manufactured and condensed* peat produced by the method recently introduced, is, for many purposes of domestic use, but especially for steam, and in the manufacture of iron and steel, superior to any other kind of fuel now in use.

This statement will undoubtedly be considered an extravagant one; but facts which are daily coming to our notice are fast conspiring to demonstrate that such is the case.

Dr. Mather, in his report in 1838, says, "During the surveys of the past season, I have collected specimens of peat from various localities. Some of them, now when dry, are compact enough to receive a slight polish, and have as great a specific gravity as bituminous coal, and would probably give out as much heat."

In his report in 1839 on New York, Westchester, and Putnam Counties, he says, "Peat is now coming into use as a fuel, and must, before many years, be extensively employed for this purpose in this part of the country, where coal and wood are so expensive. The marshes of the Hudson River, in these counties, that will yield peat, may be estimated at 1,000 acres, with a yield of 2,000 cords per acre, or 2,000,000 cords. These include those near Sing Sing, Verplank, Peekeville, Anthony's Nose, Constitution Island, and numerous smaller ones. The peat in most of these marshes, where it was examined, is of inferior quality, fibrous, and contains much earthy matter. That formed in marshes in the interior of those counties is of much better quality, and far superior as an article of fuel." And later, in 1840, he writes: "I would again urge upon our farmers and other citizens the importance of making use of peat for fuel. It is a cheap and valuable fuel; and, when properly prepared, it also makes one of the best renovators of the soil. Peat is equal in value to oak-wood, bulk for bulk."

Rev. Mr. Shafter, of New York, says, "The peat, by drying, acquires a high degree of solidity. It is easily kindled, burns with a bright flame, yields a bluish smoke, and produces an odor similar to that which attends the combustion of gramineous substances. But this is momentary. When thoroughly kindled, it burns with less flame, yields a small proportion of blackish smoke, and sulphurous acid gas is evolved, though I cannot discover any pyrites. It burns for a long time, and emits a great body of heat. It leaves a very small proportion of light and grayish-white ashes. I cannot refrain from expressing my opinion that this variety of peat will answer as an excellent substitute for the best Liverpool coal."

Professor E. Emmons says, "From the abundance of peat in this State, it appears that the climate and other circumstances are favorable to its production. It is not so hot as to cause a rapid decomposition of vegetable matter, nor so cold as to prevent those changes, somewhat allied to fermentation, which are required for its formation.

"Contrary to expectations, I find it in great abundance in the counties of Clinton, Warren, and Hamilton; and I may state, in general, that most of the flies in those counties abound in this substance.

"The only places where it can occur are those of a marshy character, and the substance itself may be tested by any person by first drying and then igniting it. If it burns, it is peat. As its presence may be suspected in all low, wet places, especially those bordering on ponds and lakes, it will be well to search for it in all such places by thrusting down a pole or stick, and trying the matter that adheres to it, as it regards its combustibility; or it may generally be found wherever the surface of the ground is easily agitated by passing over it. One of the largest collections of this substance, which has fallen under my observation, is in Champlain, in the county of Clinton. The peat marsh or fly to which I refer is in the west part of the town, and is about two or two and a half miles in length, and from a half to three-fourths of a mile in width. Over the whole extent of this fly, a pole may be thrust down from twelve to thirty feet, and probably in many places to twice thirty feet. It is, of course, nearly inexhaustible. Others of nearly equal extent occur in the county, and many which are less extensive. One fact which applies to all the peat marshes of this neighborhood is, that they are situated far above the level of the lake, and that those marshes which are on or near the same level as the lake do not contain peat.

"Peat, as is well known, answers a good purpose for fuel, and undoubtedly ranks next to coal for sustaining for a long time a high temperature. There is no substance which would remove so much suffering among the poor as the general introduction of this substance for fuel in our larger towns and cities. Its abundance and cheapness recommend it to the attention of the public; and, if measures could be devised to bring it into use in this State, many important results would follow."

The following are some of the most valuable localities in the State, though there may be many others of equal or greater importance: —

A large portion of what was once a part of Peat Marl Pond, four miles north of Kinderhook, is filled with peat, and has become a marsh. Other parts of this pond are filling with the same combustible and with shell marl. It is estimated that sixty or seventy acres of this pond and marsh are filled with peat. It has probably a mean depth of at least six feet, and ought to yield sixty thousands cords of good peat.

A small bog, of about six acres, is on the farm of Cornelius P. van Allen, three miles north of Kinderhook. The peat is of fine quality, at the depth of two feet from the surface. It has a mean depth of about nine feet, and ought to yield nine thousand cords of good peat.

Another, similar to the above, in the north part of Stuyvesant, contains about the same quantity.

Round Pond, in the north part of Kinderhook, contains two thousand to three thousand cords.

The marshes and shallows of Kinderhook Lake probably contain twenty thousand to thirty thousand cords.

A small bog between this lake and North Chatham contains perhaps two or three acres of peat.

In the marsh west of the post-road, one mile north from Kinderhook, there is said to occur a considerable quantity of peat.

The marsh belonging to Mr. Lucas Hoes, one mile south-west of Kinderhook, near the post-road on the east side, contains about thirty acres, with a mean depth of six feet.

Several other localities are said to occur in the valley of Kinderhook Creek, between Kinderhook Village and Stuyvesant town-line.

A peat-bog is also said to occur two miles north-east of Valatie.

Peat-bogs occur in many places in New Lebanon, among which may be mentioned those on Mr. Gillett's and the adjoining farms, and on Mr. Tilden's.

Another, south of Mr. Carpenter's, of fifteen acres, and three to twelve feet deep.

Another, south of Fitch & Kirby's store, owned by Mr. Waite, of about thirty acres.

Peat occurs near the west side of Canaan Mountain, around Adgate's Pond. The aggregate amount in this township is probably four hundred thousand cords.

Peat occurs on Rowland Story's farm, a quarter of a mile east of Lafayette Corners, in Milan.

A bog of peat, five or six acres, with a depth of five or six feet, occurs a mile and a half east of Upper Red Hook.

Another between Stormville and Hopewell.

Several bogs between Hopewell and Fishkill appear to be peat-bogs. They contain probably an aggregate surface of forty acres.

A peat-bog of five or six acres is located about a mile and a half from Stormville, on the road to Beekman.

An extensive peat-bog extends north from Long Pond down the valley of its outlet.

A large body of peat is said to exist on Mr. Legget's farm, in Ghent.

Peat probably exists in the marsh east of Great Nutten Hook.

Extensive deposits are found a mile or two west of Malden.

Two or three small peat-bogs occur in the south part of the town of Ghent. They may contain ten or fifteen acres.

A small marsh of ligneous peat occurs about a mile and a half north of Hillsdale.

There is an extensive peat-bog on Lawrence Smith's and the adjoining farms in Amenia. Prof. Cassels reports it to have an area of about one hundred and fifty acres, and contains probably one hundred and fifty thousand cords.

He also reports that there is a peat-bog four miles north-east of Dover, on the east side of the creek; another, one mile south of the above; another, one mile south of the last mentioned; one also two miles south of Dover; and one eight miles south of Dover. These contain an aggregate of probably seventy-five thousand cords.

Extensive peat-bogs are found east of Elbow Mountain, which lies east and north-east of Dover. They are in the valley through which the road passes from Kline Corners to the Columbia Furnace, in Kent. The northern one is about three-quarters of a mile long, and two hundred to three hundred yards wide, with an unknown depth. Its depth was measured in several places, and it was generally five feet deep within five rods of its edge. It was once a lake, now filled with peat. Its mean depth may probably be placed at nine feet, its area at sixty acres, and its contents at ninety thousand cords.

The other bog, south of this, probably contains forty acres, with a depth of six feet; and its contents may be estimated at forty thousand cords.

Peat is found abundantly in the vicinity of Pine Plains, and some of it is of very good quality. A small bog is observed one mile south of Pine Plains. Cranberry Marsh and Cedar Swamp, near Stessing Pond, are filled with peat. It is rapidly forming in some parts of Stessing Pond.

Peat is forming on Woodward's Farm, in Copake. In Taghkanic, about a mile and a half or two miles west of Crysler's Pond, a peat-bog occurs of thirty or forty acres.

From descriptions of the drowned lands in Aucrain it is probable that peat abounds there. This marsh has an area of several hundred acres.

The marsh in the valley of Stessing Pond contains a great body of peat; probably five hundred acres are underlaid by it, two yards deep; and its contents may be estimated at five hundred thousand cords.

On Mr. Hoag's farm, in Stanford, considerable peat is found. Prof. Cassels reports that an extensive bed of peat occurs three miles east of Poughkeepsie. It is on the farm of Peter van Voorhis, and contains about twenty-five acres. It is deep.

A small bog occurs near the red schoolhouse, about two miles from Union Corners, in Dutchess County. Prof. Cassels thinks the bog is deep.

In Clinton, four miles east of Union Corners, is a peat-bog of about sixty-five acres. It is on the land of Messrs. Underwood & Denison, and contains about sixty thousand cords.

A large deposit of peat was observed by Prof. Cassels, two miles south of Union Corners, on the land of Elias Tompkins. It was estimated by him at ninety acres.

Mr. Merrick observed a small peat-bog, about two miles north of Hurd's Corner, in Pawling, containing probably five thousand cords.

Another, of nearly sixty acres, in the south-east part of Stanford, with a depth of about six feet.

Shaw Pond and Mud Pond, between Stanford and Washington, and Round Pond, in Washington, are filling up with peaty matter.

Rev. Mr. Shafter, of New York, observed peat in Rhinebeck, North-east, and Clinton, in 1817.

It may be estimated that there are five square miles of peat in the salt marshes of Westchester, or three thousand two hundred acres, which will yield upon an average one thousand cords of peat of the second quality to the acre, or, in round numbers, three million two hundred thousand cords. The marshes of the Hudson River, in New York, Westchester, and Putnam Counties, that will yield peat, may be estimated at one thousand acres, with a yield of two thousand cords per acre, or two million cords. These include those near Sing Sing, Verplanck, Peekskill, Anthony's Nose, Constitution Island, and numerous smaller ones. The peat in most of these marshes is supposed to be of inferior quality, fibrous, and containing much earthy matter. That formed in marshes in the interior of those counties is of much better quality, and far superior as an article of fuel.

On Joshua Raymond's farm, one-fourth of a mile west of Bedford, in Westchester County, Prof. Cassels reports that there is a peat-bog of sixty acres.

Also on Abraham Underhill's farm, two and a half miles south of Crum Pond Village, Westchester County, Prof. Cassels reports fifty acres, averaging twenty feet in depth.

A peat-bog of thirty or forty acres lies near the east side of Mahopack Pond, in Putnam County.

A large peat-bog was observed near Patterson, Putnam County.

A peat-bog of six or eight acres was observed in Phillipston, on the Phillips Estate, about two miles east-north-east of West Point.

Another, on the same estate, about eight miles from Cold Springs, on the turnpike-road to Putnam Court House, may contain fifteen or twenty acres.

Another, on the road from Putnam Court House to Patterson, in Putnam County.

Another, four miles south-east of Peeksville, of six or eight acres.

Another, about one mile south of Scrub Oak Plains, Westchester County.

Another, east of Stewart's iron mine, at the base of the hill.

Another, half a mile south of do., in Phillipston.

Another, near Davenport's Corners, five miles north-east of Cold Springs.

Another, half a mile west of Saxon Smith's, in the south-south-east part of Phillipston.

There is said to be a fine deposit of about one hundred and fifty acres east of Croton, and about four miles south-east from Sumerstown Plains.

Several of the salt marshes in this region contain peat, mostly fibrous, and of inferior quality. That of finer texture and quality may probably be found at a depth of four or five feet. A moderate estimate of peat of second quality in these salt marshes would be five hundred thousand cords.

A peat-bog of about forty acres was examined by Prof. Cassels, about one mile south of the Long Clove, in Rockland County. It is on land of Isaac B. Van Houten. It is supposed to have a mean depth of six feet.

Another is in the valley of the Hackensack River, about two miles west of Nyack, and contains about fifty acres, with a mean depth of six feet.

Peat, a few acres in extent, was observed by Prof. Cassels at the north end of Rockland Lake.

Prof. Cassels reports a peat-bog of forty acres on land of John Snediker, one mile south-west of Snediker's Landing, with an average depth of six feet of good peat. This peat-bog has been wrought for the New-York market. It was opened during the summer of 1838,—

The proprietor receiving.............	25	cents per chaldron.
The cartage to dock................	37½	" " "
Freight to New York...............	37½	" " "
Expense of digging and curing.......	50	" " "
	$1.50	" " "

It has been sold in New York at $3 per chaldron, or $4.50 per cord.

Prof. Cassels observed a bog of fifty acres of peat between the lower village of Clarkston and the Hackensack River. Its average depth is stated to be six feet. It is on lands of William O. Blines, Levi J. Gurnee, and others.

Extensive peat-bogs were observed on the mountain, near the turnpike from Haverstraw to Munroe Works. One contains about forty acres, another about fifty acres.

Some other smaller bogs were seen, containing, perhaps, twenty thousand cords. Another was seen in the valley of Stony Brook, containing, probably, ten thousand cords.

At the north end of Long Pond, near the west line of Rockland County, a deposit of peat was observed.

A peat-bog of about ten acres occurs about one mile south-west of Stony Point.

Several small peat-bogs were observed near Fort Montgomery, that in the aggregate may contain ten thousand cords. There is a small one south of Fort Putnam, and near it; another south-east; another south-west; all within one-fourth of a mile.

A peat-meadow occurs on the mountain, half a mile west of Round Pond, five miles south-west of West Point, on land of Mr. Wilkins, and contains ten thousand cords.

A small peat-bog was seen between the Limestone Ledge and Duck-Cedar Pond, in Warwick, and may contain four thousand cords. Another was seen near the Patterson Mine.

Another near the Crossway Mine, and another east of the Starling Mine.

Another, of sixty to one hundred acres, in the valley of Smith's Clove, between Wike's and Galloway's.

A peat bog lies west of Townsend's ore bed in Canterbury, and contains ten thousand cords.

In the slate and graywacke region of Orange County, peat is everywhere abundant; and the localities are so numerous, that it would be tedious to enumerate them. The drowned lands, the Graycourt Meadows, and the Black Meadows, are the most extensive of these deposits. The former marsh is most extensive, and contains seventeen thousand acres. At a low estimate, there must be twenty-five thousand acres of peat-bogs in Orange and Rockland Counties that have not been estimated; and we may calculate, in round numbers, that they contain twenty-five millions cords of peat.

In the drowned lands, several thousand acres are covered with this substance: it is from three feet to several yards in depth, and, on trial, proves a good fuel.

The Graycourt Meadows, lying in Goshen and Blooming Grove, contain five hundred acres of peat, several feet in depth. It exists in great abundance in Warwick, Minisink, Goshen, Monroe, Cornwall, Blooming Grove, New Winsor, Newburg, Montgomery, Hamptonburg, Crawford, Walkill, and Mount Hope; all the towns in the county, except Deerpark. In this latter town the quantity is small. The quantity in the county is unusually large in proportion to its extent; perhaps as much or more so than any other county in the State. It would require a great amount of time to ascertain the number of acres. It is perfectly inexhaustible. If its consumption for fuel ever becomes as general as it in some parts of Europe, the Graycourt Meadows and drowned lands would prove a source of immediate revenue to their proprietors.

Many smaller deposits of this substance are found in the towns of Schroon, Chester, Warrensburg, Johnsburg, Queensburg, Lake Pleasant, and Wells, varying in extent from one to five acres.

The summits of the Delaware and Hudson Canal, between Wurtzborough and Red Bridge, in Sullivan County, contain about fifty thousand cords.

A marsh extending down the valley of the Basher's Kill, from near Wurtzborough towards Cuddebackville, contains a thousand acres.

A bog a few miles west of Ellenville is said to contain about one hundred acres.

The bog in the valley of Three Brooks, south of Monticello, about four hundred acres.

The marsh one mile south-west of Monticello, belonging to Hon. Mr. Jones and others, about fifty acres.

The marsh half a mile south-west of Monticello, belonging to Hon. Mr. Jones, eight acres.

The marsh half a mile west of Monticello, belonging to Hon. Mr. Jones, say ten acres.

Several marshes between Monticello and Bridgeville, on the Neversink, perhaps fifty acres in all.

Bog between Dashville and Esopus, on the north end of the Passant Binnewater, say forty acres.

Bog one mile north of the above, on the north branch of the south fork of Black Creek, in Palts, Ulster County, perhaps ten acres.

Bogs on Black Creek, near the Poughkeepsie and Palts Turnpike, about fifty acres.

Bog in the valley of the east branch of the Delaware, in Roxbury, Delaware County, on Mr. Straton's farm, about ten acres.

Bog in Marlborough, on the south road from Marlborough to Pleasant Valley, on land of G. Birdsal, Mrs. Bingham, and D. Cassman, in Ulster County, about twenty acres.

A few deposits of this substance have been discovered in Otsego County, on the farm of Mr. Clark. Two miles south of Cooperstown is a small peat swamp, nearly surrounded by alluvial hills, covering an area of six acres. The peat is apparently of good quality, and may be made accessible with little expense. Several other small marshes of a similar character are found in this neighborhood. On the road from Cooperstown, west towards Oakville, are several small deposits. Two miles south of New Berlin, on the east side of Madilla, is a peat-swamp, covering an area of forty-five or fifty acres. This is the most extensive deposit of the kind of which we have any knowledge in this region. Its depth is unknown: in several places a pole was thrust down ten feet. It is probably much deeper.

In the towns of Great Valley and Little Valley, the "sags," or depressions in which the clay is formed, contain more or less extensive bodies of peat. The largest is upon the land of Mr. Sweetland. About ten acres are spread over by the bog; and the depth of peat varies from a foot or two near the margin to more than twelve towards the centre.

About ten acres between Reed's Mineral Spring and Argyle, in Washington County; fifty acres at the south end of Summit Lake, in South Argyle, and one or two other deposits, comprising perhaps thirty acres, in the same town; twenty-five acres on A. McNeil's farm, in N. Greenwich; ten acres on P. Reynolds's farm, in the same town. About one hundred acres lie between N. Argyle and Hartford; seventy acres one mile southeast from N. Greenwich; ten acres in Greenwich, about a mile and a half south-west from Lakeville; and probably about four hundred or five hundred acres in various places in Greenwich, about a mile south from Lakeville; ten acres on Stephen Durham's farm; and about ten acres on Simeon Burton's land, in Easton. In Salem, about three miles north from the village, is a tract of about one hundred and sixty acres; and about four miles north-east from the village is a tract of one hundred and thirty acres. In West Hebron we find about twenty acres, two miles south-west from the village; and in Kingsbury, on the Champlain Canal, lie something like a thousand acres. At Fort Ann, two miles north-east from Mount-Hope Furnace, is about thirty acres; and between the two lakes south of Mount Hope lie about fifty acres. In Dresden are several deposits, amounting to about one hundred acres. In Putnam, four miles north-west from the ferry, there are about thirty acres. In Greenbush, on the Boston Turnpike, is a small deposit; and another of a few acres on land of Mr. Clark, at Coyeman's, three miles from New Baltimore, in Albany County. In Hamilton County, Marion River, about seven miles in length, connects the Eckford Lakes with Racket Lake: it passes through an immense marsh containing an inexhaustible quantity of peat, and upon which, as in numerous other localities, there is a great amount of tamarack, especially valuable for ship-timber.

Bones of the mastodon were found in 1790 and 1800 in the town of Montgomery, about twelve miles from Newburg, in Orange County, ten feet below the surface, in a peat-bog in marl. Several bones of the legs, some of the vertebræ, several ribs, and some of the bones of the head, were obtained. One of the leg-bones measures more than forty inches round the joint, and thirty-six on the cylindrical part of the bone, and is nearly five feet long. The teeth are nearly seven inches long, and four broad: they are found white, and fast in the jaw, without appearance of decay. The holes in the skull, where the nostrils appear to have been, measure eight inches in diameter.

Eight similar skeletons have been discovered within eight or ten miles of this point, and some of them were fifteen or twenty feet below the surface of the earth. Some bones of these animals were found in 1782, three miles south of Ward's Bridge, in Montgomery; another, one mile east of this bridge; another, three miles east; another, seven miles north-east; another, seven miles east; another, five miles westwardly; and another, ten miles north, in Shawangunk. Similar remains were found in digging the Delaware and Hudson Canal, in a peat bog between Red bridge and Wurtsborough, in Sullivan County. Fossil bones of the mastodon and elephant have been found in other parts of Orange County.

These facts are gathered from a paper by Sylvanus Miller, published in the "Medical Repository," New York, 1801. Mr. Miller, in a letter to De Witt Clinton in October, 1814, narrated some of them, and mentioned the additional circumstance, that, in some cases, considerable locks and tufts of hair were found with the skeletons. It was of a dunnish-brown color, from one and a half to seven inches in length, and retained its natural appearance until exposed for some time to the air, when it gradually mouldered away into a kind of impalpable dust.

Mention is made of the skeleton of a mastodon found in Genesee, in marl, below a bed of peat.

NEW JERSEY.

We do not learn that much interest has ever been manifested in utilizing the rich deposits of peat in this State. It is well known, however, that numerous shell marl-beds or pits are exclusively and profitably worked for fertilizing purposes. These marl-beds are usually found to rest upon a bed of clay, sand, or gravel, and are succeeded by peat or muck, the depth of the peaty deposits varying, according to the statements we have seen, from three to twenty feet. Peat, varying in quality for purposes of fuel, is found in Montague, Harrisville, Sandiston, Vernon, and other localities.

It will be interesting in this connection to note something of the cedar-swamps, which are a remarkable feature of Southern New Jersey. They are common in all the counties south of Monmouth; but probably the most extensive are in Cape May, and the adjoining parts of Cumberland and Atlantic Counties. The Cedar-swamp Creek, which runs into Tuckahoe River, and

Dennis Creek, which runs into Delaware Bay, head in the same swamp; and the whole length of the two streams, a distance of seventeen miles, is one continuous cedar-swamp. The wood is the white cedar. It grows on peat, and its roots run near the surface. In the present growth of standing timber, scarcely any trees are to be found more than one hundred years old; but these rest upon a formation containing we know not how many generations of trees which have lived and fallen before them. Large stumps are frequently found standing directly on other large logs, and with their roots growing all around them, and then other logs still under these; so that one soon becomes perplexed in trying to count back to the time when the lower ones were growing.

Dr. Beesley of Dennisville, some years since, communicated to the newspapers an article on the age of these cedar-swamps, which was copied by Professor Charles Lyell, in his "Travels in the United States;" in which Dr. Beesley says that he "counted 1,080 rings of annual growth between the centre and outside of a large stump, six feet in diameter; and under it lay a prostrate tree, which had fallen and been buried before the tree, to which the stump belonged, first sprouted. This lower trunk was five hundred years old: so that upward of fifteen centuries were thus determined, beyond the shadow of a doubt, as the age of one small portion of a bog, the depth of which is as yet unknown."

Mr. Charles Ludlam counted seven hundred rings of annual growth in an old tree, which was living when cut down. The trees stand very thick upon the ground, and grow rapidly at first; but as they increase in size, and crowd each other, the tops become thin, and the annual growth exceedingly small. The rings near the centre of a large cedar-log are often almost an eighth of an inch in thickness, while those near the bark are not thicker than paper. The soil in which these trees grow is a black, peaty earth, composed of vegetable matter, which, when dry, will burn, leaving not more than three or four per cent of an ash almost insoluble in acids, and without the slightest alkaline taste. This earth is of various depths, from two or three up to twenty feet or more; and the trees which grow on it have their roots extending through it in every direction near the surface, but not penetrating to the solid ground. When this earth is open to the sun and rains, it decays rapidly; but when covered with a growth of trees, and so shaded that the sun does not penetrate to the ground, it increases rapidly, from the annual fall of leaves, and from the twigs and small trees which die and fall. Trees are found buried in this peaty earth, at all depths, quite down to solid ground. The buried logs are generally quite sound: the bark on the under side of many of them is still fresh in appearance. The color of the wood is preserved, and its buoyancy retained. When they are raised, and floated in water, it is observed that the side which was down in the swamp is uppermost. These logs are so abundant in some parts of the swamp, and in the salt marshes bordering on them, that a large number of men are constantly occupied in raising and splitting them into rails and shingles. Our authority states that in Mr. Ludlam's swamp this business was commenced fifty years ago, and has been carried on every year since; the annual product sent from Dennisville alone, averaging, for a number of years, not far from 200,000 rails, worth $8 to $10 per hundred, and 600,000 shingles, worth $13 to $15 per thousand. The size of the logs raised is generally from one and a half to three feet in diameter, though four feet is not uncommon; and they have been taken out five, six, and even seven feet in diameter. In searching for logs, the workman uses an iron rod, which he thrusts into the mud until it strikes one; then, by repeated trials, he judges of its direction, size, and length: the stumps, roots, and earth are removed from over it; it is loosened by means of levers, and soon rises, and floats in the water which has accumulated in the excavation.

PENNSYLVANIA.

Of peat in Pennsylvania, the great coal-bearing section of this country, we shall hardly be expected to say much; but some remarks contained in the Geological Report of that State, published in 1858, upon the analogies of origin and structure of peat and coal, are of so much interest, that we shall make brief extracts.

"Peat-bogs are nothing but beds of coal, not entirely ripe or burned out. We have to mention some very interesting and striking analogies, such as the presence of bitumen in both formations. It has been asserted that bitumen could not proceed from plants, but it is everywhere obtained by the distillation of peat.

"We would show the identity of the geographical distribution of both formations, though it has been long asserted that the peat formation belongs to a cold climate, and the coal to a warm one; also the affinity of forms in their plants, — forms particularly adapted, it seems, to the absorption of the vapors, and the transformation of carbonic acid in woody matter; and show the large amount of wood in the plants of our peat-bogs, even in the mosses (*sphagna*), which, though very fragile, soft, and thread-like plants, have a larger proportion of woody matter than the hardest of trees.

"The analogy of formation being established, we do not see any reason to theorize about the general flora of the period of the coal formation.

"'Our peat-bogs have more than seventy species of mosses, five or six species of *lycopodiaceæ*, and as many species of ferns, eighteen or twenty species of palm-trees, reeds, and phanerogamous monocotyledonous plants; and our peat-bogs are now essentially a compound of such plants, sedges, grasses, reeds, &c. The trees that are now living on these bogs — viz., the pines, birches, &c. — probably take the places of the large series of palm and fern trees of the marshes of the Old World.'"

After making the above quotation from a French author, the report continues: —

"The above was written ten years ago: since then, the palæontology of the plants has made very great progress, and a great many new species have been discovered. Nevertheless, this analogy in the vegetation of both formations — the coal and the peat — has become more and more evident.

"In the peat-bogs of North America, ordinarily named cedar-swamps, there are, first, about twenty species of mosses of which the growth directly contributes to the formation of the peat." They are enumerated.

"Of these species, one only is peculiar as an American plant: all the others, without exception, have the same plan, the same destination, and are found in the same abundance, as in the peat bogs of Europe. There are, second, many other species of mosses which are growing only on the peat, but which do not claim a large share in the combustible matter.

"The sedges and grasses are distributed, also, in the same proportion.

"The trees have some species which cannot be compared; but a great many of them, the birches and alders, are nearly alike.

"The type of the flora of the peat-bogs is everywhere the same, and is susceptible of proof, as well from our explorations in the great bogs of Southern Virginia as from the observations of travellers in the Australian hemisphere.

"It has been long asserted that the peat-bog formation belongs particularly to cold climates, and that the preservation of the woody matter is essentially due to low temperature. Our researches in Europe on this subject have already proved that this is not the case, and that the area of the peat-bogs occupies exactly the same latitudes as that of the oldest coal formations. And since we have been enabled to pursue the same explorations in America, we have found on this continent exactly the same distribution; for in this country the peat-bogs are found from far above the northern shores of Lake Superior, as high as 60° of latitude, to the great Dismal Swamp in South Virginia, 35°, exactly in the same latitudes as are occupied by the great coal basins of America. We have made on the same subject very long researches.

"But how is it possible to account for the vegetation, in our latitude, of those immense trunks of trees, perhaps of fern-trees, to which we find an affinity only in the tropical regions, if we do not admit of a great change of temperature?

"In the peat-bogs of northern countries, — of Denmark, Sweden, and Switzerland, — we find sometimes, heaped in very thick strata, much larger trunks of trees than those which have been found in the coal.

"The following is a description, given in 1846, of a peat-bog which we visited, near Waldsmarslund, thirty miles above Copenhagen: 'These deposits of wood are a true forest, heaped upon another, and buried in the peat, which in the marshes of Denmark are found everywhere with alternating beds of the same species of trees. At the bottom, upon a bed of peat from four to six feet thick, are *pine-trees*, lying flat, nearly always in the same direction as the inclination of the basin ; viz., the roots against the borders. These pine-trees are ordinarily from six to ten inches in diameter: their slightest branches are preserved, and they are embedded in a mass of their own leaves, cones, mushrooms, &c., of which the form is not at all altered. Upon these pines is a bed of black peat, from five to six feet thick, overlaid by a forest of prostrate white birches. Upon the birches there is again six feet of less decomposed peat, covered with enormous trunks of oaks, which have no less than three feet of diameter, and of which the wood is so well preserved that it is sawed on the place, and used for building material. The peat in which these trees are buried does not preserve any trace of the leaves of these oaks, but only some acorns. It is evident, nevertheless, that they have grown on the place where they are found, being preserved in their integrity, with their smallest branches and their bark. These trees are covered by from six to eight feet of peat, in which or upon which is found sometimes a fourth forest of trees, and this time of beach-trees, the same trees that now form the forest around.'

"The size of the trunks buried in the peat-bogs is, as is easily seen from the above description, in favor of our present formations. In the Dismal Swamp of Virginia, we have seen, in the peat, trunks of magnolia measuring more than one hundred feet, without great diminution in their diameter. The trees of the coal which are ordinarily ascribed to a genus of plants like the ferns, and so to fern-trees, were not true ferns, but a peculiar species of plants, of which we have no living representatives, and of which the nearest relatives are the lycopodiaceæ, a genus of plants of which the largest species known are living in the peat-bogs and the forests of our northern hemisphere.

"Our human race is young, but the world lived long before it. Truly, Nature has prepared our home. It has heaped, for the future welfare of our race, those inexhaustible beds of combustibles that afford us so much comfort ; but it has done this without any miracle, without any of those sudden transitions which we are so prone to discover for the satisfaction of our own pride. This coal formation" (and the same is equally true of peat) "is an admirable one, and we can look to it only with wonder, and with faith in an overruling Director; for this heaping of combustible matter was by itself nothing but a useless proceeding. The bed to put it in was to be prepared, a long time in advance, by a thick layer of clay, to prevent the egress and the dispersion of the bitumen after its separation from the woody matter. It required, also, an impermeable covering to prevent too strong an action of the oxygen, and the mingling of sand and other strange matters, which would have entirely changed its combustible property. This, as well as the formation of iron, which is also ordinarily in progress with the formation of the peat-bogs, has been obtained by the simplest laws and the slow progress of Nature.

"This proceeding does not come to its end without a great many changes.

"We have seen some beautiful illustrations of these changes in Germany and Denmark. Near Leipsic there is a bed of lignite, formed of large trunks heaped about fifteen feet thick. The matter is entirely soft, and all the trunks flattened, measuring in one direction scarcely half the diameter they have crosswise. It is also entirely black, and yields an excellent fuel. It is extracted with shovels, like peat, after its surface has been laid bare from twenty feet of sand and gravel lying upon it.

"In Denmark, about twenty miles below Copenhagen, near the seashore, there is an extensive plain, covered with the finest grass, and affording excellent pasturage to large herds of cattle. By digging there, they find, under one foot of humus, a bed of *peat*, entirely composed of bark of birches. This bark is heaped six feet thick, and closely packed and flattened. It is cut out and dried in long rollers, entirely void of earthy matter. The woody matter, nearly fluid, or transformed into a very soft yellow mass, is at the bottom of these beds, and is taken out of the excavations with buckets, spread on layers of straw, through which the water percolates, and, when thickened, it is beaten hard, dried, and burnt like coal."

MICHIGAN.

Dr. Douglas Houghton, State Geologist, dwells with much earnestness on the abundance and value of the peat deposits of this State, which he considers of great importance, not only as a combustible, but as a manure. The beds are generally comparatively shallow, seldom exceeding four feet in thickness. It is of a fibrous character, not very compact, and cannot be said to be of even ordinary quality for fuel, compared with those deposits of which we have had occasion to speak as "superior."

WISCONSIN.

Throughout the valleys of this State, peat is very abundant; and, in a district where vegetable and mineral fuel is so scarce, it seems highly probable that it will, at some future day, be resorted to as an extremely valuable substitute for coal and wood. These valleys present a very peculiar character, in one respect; which is, in the singularly level planes which are maintained in their entire breadth. They appear as if they had once been filled to a uniform level, in the manner of a dam, from bank to bank, or like artificial reservoirs from which the waters have escaped. These level bottoms consist of peat-beds to an unknown depth; and small streams meander through them, having muddy bottoms, and frequently expanding into swamps.

It would seem that these Wisconsin valleys have acquired this peculiar uniformity of plane surfaces from the depositions of earthy matter in the first instance, succeeded by the growth and decay of that class of coarse aquatic vegetables which prevail under such circumstances. It was stated in a paper upon this subject, published in Boston, by Mr. Samuel Nicholson, in 1857, that "Dr. A. A. Hayes, State Assayer of Massachusetts, in a report to some parties owning extensive peat-bogs near Madison, Wis., says, 'You will see by the certificate within that your peat has a marvellous power in producing gas: it exceeds all common cannels; and, of course, is far above any bituminous coal. There are only two or three cannel coals known which afford so much illuminating material, placing this peat in the first class of gas materials.' "

PEAT IN THE MANUFACTURE OF IRON.

It is not generally understood that peat can be advantageously used in the manufacture of iron; but the instances we are able to cite, and the facts we gather from various sources, will, to say the least, go far to show that there is good reason to believe that it may be used economically and profitably, and that it will tend to the production of superior qualities of iron.

The time was, when the English forge-masters maintained, with all the energy of conviction, that pit-coal could never be used in the fabrication of iron; and they treated with ridicule all who made such attempts. We have witnessed the success of those who proved by persistent efforts and experiments that it could be done, and the result is its universal and successful application.

So also with the employment of anthracite coal in the process of iron-making. It had baffled, for a long series of years, every attempt to employ it, and was repeatedly pronounced so surrounded with difficulties as to be impracticable; but it is well known that it is now managed with equal or even more facility than bituminous coal.

We expect to be able to show that it is not only practicable to employ peat as the fuel in fabricating iron, but that it has absolutely been in full operation on an extensive scale; in high furnaces, in puddling and refining, in cubilot and in reverberatory furnaces, in forges, and, in fact, in nearly all the processes of iron manufacture.

It has been satisfactorily experimented upon; but we are not aware that it has been used to any extent, for any of these purposes, in our own country.

In England, France, Italy, Bohemia, Bavaria, Westphalia, Wurtemberg, and in several adjacent provinces, it has been successfully employed on a large scale, and with very satisfactory results. These practical tests and proofs of the value of peat for the purposes under consideration, surely cannot, if generally known, remain long unheeded or unimproved by the enterprising iron manufacturers of our own country.

In a paper on this subject, by Mr. A. S. Byrne, published in 1841, he remarks that charcoal iron is the best known at present in the markets; and, as an illustration of its value and superiority, states that large quantities had been annually imported into England from India and China, and sold at the (then) enormous price of £36 (=$173) per ton. He contends that *peat coke is of still greater value than the best charcoal*, and that, *in the manufacture of iron, it stands unrivalled as a fuel.*

The admixture of peat, even in its natural state, with common coke, in smelting iron, materially improves its quality; in some instances changing the pig-metal from the state of "white iron" to that of "gray iron," technically called "foundery."

Good peat is shown to be preferable to any other fuel, not only for the process just mentioned, but in welding, and for softening steel-plates, &c.

For the finer iron works, peat and peat charcoal are known to be better than wood charcoal.

Sir Robert Kane, in his "Industrial Resources of Ireland," published in 1844, demonstrates that the precious Baltic iron, for which, at that time, £15 to £35 per ton, was readily paid, could be equalled by Irish iron, smelted by Irish turf, for £6. 6s. per ton.

From other sources we learn that iron manufactured with peat fuel is more malleable than Swedish, and that tools made from it are of superior quality.

It has been doubted if peat could be used in the puddling furnace, except with a diminished produce; yet the working of iron by this fuel is known to improve its quality, and the welds, especially, are superior to those made with coal.

It has been proved, that, after peat has been well carbonized, it may be employed in puddling and reverberatory furnaces and forges. As to its use in blast furnaces, peat, which is the lightest of all coals, would consequently seem to be the least fitted for the reduction of ores. But even this difficulty has, in great measure, been surmounted in the high furnaces of Germany.

M. V. Lamy made a series of experiments to determine the quantity of heat evolved by the burning of peat, compared with other combustibles, with the following results: —

One kilogram, or 2¼ lbs., of the varieties of fuel mentioned below, evolved of caloric the following parts: —

Wood charcoal	75	parts.
Coal Coke	66	"
Charred Peat	63	"
Bituminous Coal	60	"
Charred Wood	39	"
Dry Wood	36	"
Raw Peat	25 to 30	"
Wood with ¼ moisture	27	"

Thus, as regards charred peat or turf charcoal (from ununsolidified peat), it appears preferable to bituminous coal in the manufacture of iron, and is almost equal to wood charcoal.

Compressed peat, thoroughly dried, gives a steady and intense heat, and can be used with decided advantage in a puddling furnace. In fact, it has been extensively used, and the results have been very carefully investigated by men of science, as well as of profound practical attainments, and with uniformly gratifying results, demonstrating conclusively the superiority of the article, although it cannot be claimed that any one has yet arrived at a perfect method of preparing and using it; but enterprise and inventive genius are fast developing both.

From a statement of experiments made by M. Le Serge, found in the "Repertory of Arts," vol. v., it would appear that ordinary turf, charred, is capable of producing a far more intense heat than common charcoal. It has been found preferable to all other fuel for case-hardening iron, tempering steel, forging horse-shoes, and welding gun-barrels.

Since turf is partially carbonized in its native state, when it is condensed by the hydraulic press or otherwise, and fully charred, it must evidently afford a charcoal very superior in calorific power to the comparatively porous article prepared from wood by fire.

At Königsbronn, in Wurtemberg, they execute with peat alone the refining and second fusion of the pig metal; its puddling, the reheating of the lumps and rolling the bars and plates; in fine, all the operations that are made with coal in English forges. The works are under the care of M. Veberling.

The peat is of three kinds, as follows: —

1st. Peat of Dattenhausen. — Color varying from dark yellow to brown, and containing a very considerable amount of fibre or interlaced filaments: yields ashes 3½ to 4 per cent.

2d. Peat of Guntzburg. — Color, dark brown to black, compact, and yields ashes 6 to 7 per cent.

3d. Peat of Wilhelmsfield. — Dark brown, and yields ashes 5 to 6 per cent.

The peat used at these works is first dried in the air at the place where it is dug, the blocks being turned occasionally, and, after some three or four weeks' exposure, are transported to the iron works, and there further dried in kilns by artificial heat, and stored in dry quarters for use.

Of the three kinds of peat mentioned above, the proportionate diminution of weight and volume, when dried, is as follows:—

	1st.	2d.	3d.
Diminution of volume	.24	.10	.13.5
" " weight	.10	.19	.12

Cost of one metrical quintal = 220 lbs., delivered at the iron works of Itzelberg, is 1 fr. 29 c. = 36 cents, or about $3.50 per ton; the distance being two kilometres, or 1¼ miles.

M. Berthier's analysis of peat used at Königsbronn is as follows: —

Carbon	24.40
Volatile Matters	70.60
Ashes	5.

It is employed without admixture of other fuel in the refining, puddling, and reverberatory furnaces.

According to M. Lefebvre, whose statements appeared in the "Annales des Mines" in 1839, peat was used to a considerable extent at the iron-works of Ichoux, in Les Landes; and the proportions which resulted from the operations at the refining and puddling furnaces and forge operations at these works, chiefly through the use of peat, were as follows: —

114 kilog. pig iron produced 100 kilog. bar iron, with 93 kilog. peat, and 52 kilog. wood.

116 kilog. pig iron produced 100 kilog. bar iron, with 93 kilog. peat, 37 kilog. wood, and 9 kilog. coal.

The peat of Ichoux contains two and a half times more ashes than the peat used at Königsbronn, in Wurtemberg, of which mention has just been made in these pages.

In 1842, the establishment in Ichoux was the only one in France where peat was used to any extent for the processes above referred to; but with the knowledge of the success attained there, and the low price at which it might be obtained at numerous points in the kingdom, it would seem impossible that many years should elapse without its general introduction and use in the numerous iron and steel works there.

At the iron-works of Ransko, in Bohemia, peat is used with great success. These works are situated at the south-west extremity of Bohemia. They consist of two high furnaces and two cubilots, which are worked with a mixture of turf and charcoal. There are also several refining fires, and the establishment gives employment to about four hundred men.

The turf is brought from turbaries situated some leagues from Ransko. It is there dug or cut in the usual manner, in bricks or oblong pieces, about fourteen inches long by six inches square. These bricks are exposed in piles in the open air during the fine season, where, in drying, they contract to nearly one-third their original size. In general, these peat bricks are not used until a year after having been dug. They are stored under sheds attached to the high furnaces, and sheltered from the rain, but receive no other or further attention or preparation. It was at first proposed to use it in the carbonized state: but, as regards this particular kind of peat, the carbon obtained was not found to be much if any more advantageous than the article in its crude state; and as the process involved some expense, without corresponding profit, it was abandoned as useless. Numerous other experiments were tried in the preparation and curing of it: but most were abandoned, for the reason that little if any profit was obtained over the original methods adopted; and they therefore continued to employ non-compressed turf, simply dried in the air.

Two varieties of peat are used here, weighing respectively four hundred and five hundred and eighty seven lbs. the cubic meter of thirty-five and one-quarter cubic feet English. They cost at the iron-works 13d. English, or 26c. United States, per cubic meter of thirty-five and one-quarter cubic feet English. The weight and cost of the same measurement of the different kinds of charcoal used in the high furnaces with the peat are as follows: —

	Weight.	Cost at the Works.
Charcoal, resinous wood,	275 lbs.	.80c.
" heavy wood,	468 "	1.06c.
" as mostly used,	314 "	.84c.

The cost of a volume of charcoal is thus shown to be more than three times that of an equal volume of peat, and it would therefore seem to be desirable to exchange, as soon as possible, the charcoal for the peat.

The ore smelted here is clay iron-stone of moderate quality, and the fuel is generally turf and charcoal mixed. The quantities employed in the making of a ton of iron are, turf thirty-five cwt., costing 8s. 10d., and charcoal thirty cwt., costing 24s. 7d., — together, £1. 13s. 5d.; and iron of the very highest character is produced.

At Schlakenwerth in Bohemia, near Carlsbad, is a high furnace which works with a mixture of equal quantities of wood charcoal and peat charcoal. The peat is found upon the plateaux of the Erezbirge, at an elevation of more than one thousand metres, and the weather and climate are such that it can be produced to advantage only during about two months in each year. It is then carbonized in much the same manner as wood, in circular piles; and a very dense charcoal is obtained, which on an average does not contain more than five per cent of ashes. The cubic meter of thirty-five and one-quarter cubic feet English of this peat charcoal weighs six hundred and sixty lbs., while the same amount of wood charcoal weighs only three hundred and ten lbs. The analysis of this peat charcoal shows fixed carbon sixty-seven, volatile matters thirty, ashes three.

In the cubilot furnaces of Bohemia, also, a mixture of equal parts of peat charcoal and wood charcoal is employed with results highly satisfactory.

Peat is employed in the iron-works of Weiherhammer, in Bavaria. It is procured from the numerous tourbieres of the Fitchtelgebirge, which are worked during the fine season, after which the turf is left to dry for about six months. It is then stored, but is not employed in the iron-works until a year after it has been dug. The peat is of good quality, compact and heavy, and, on burning, yields not more than four to five per cent of ashes.

At the Weiherhammer Works are two puddling furnaces, one of which is generally in operation. The puddled iron is converted into bars in the ordinary charcoal forges, or in a chafing fire, which is fed with peat alone. The density of this peat is hardly sufficient to produce a temperature sufficient to remelt the iron; combustion is therefore hastened by means of a forced current of air, which is furnished by the blowing machine of the refining furnace, and in this manner the remelting of the pig metal is effected with the greatest facility. The result of these operations is stated as follows: Two hundred and eighty-one lbs. pig metal, with eighty-five and thirty-two one-hundredths cubic feet raw peat, produced two hundred and twenty lbs. bar iron. These proportions are equivalent to two thousand eight hundred and sixty-one lbs. pig metal and eight hundred and sixty-eight cubic feet of raw peat to produce one ton (two thousand two hundred and forty lbs.) of bar iron.

In Germany, the gas of the high furnaces where peat is used has been satisfactorily employed in the refining of iron and the puddling of steel. At Magdeburg, in the Hartz, not only is iron refined, but steel of excellent quality is fabricated by the use of gas. The beneficial results obtained by the use of gas in refining iron, the economy of the fuel, the smallness of the loss, and the amelioration of the quality, have been urged as reasons why it should be extensively introduced in peat-producing countries.

It is considered that the known successful results of this method are of the greatest importance to the whole of Northern Germany, where extensive beds of turf and lignite prevail, which will afford a great resource to those districts. The same process would not be less beneficial to France. It has been adopted to a considerable extent in Sweden, where coal is scarce.

In an able pamphlet published some twenty years ago by J. W. Rogers, it was suggested that the overplus working population of Ireland might be permanently and advantageously employed in the preparation of different kinds of fuel from the immense bog districts. He states that he "has been in the habit of having peat charcoal prepared for smith's use, infinitely in preference to any coal," and that "if within the reach of the manufactories of iron, at the price of which it can be produced, *no other fuel would be used.*" He adds, "Charcoal of peat has been found by analysis to possess almost identical qualities with wood charcoal. Prepared as it hitherto has been, however, it is more friable, and therefore more fitted for many purposes, such as the working of iron, manufacture of gunpowder, &c.; but peat charcoal is quite capable of being prepared so as to obtain a density little if at all inferior to wood charcoal." This, it should be borne in mind, refers to charcoal from peat in its crude or unmanufactured state. Mr. Rogers adds, and the correctness of his remarks is confirmed by statements from numerous sources, that, "when *compressed* peat is carbonized, it gives a fine coherent coke, which amounts to about thirty per cent of its weight, and contains very little ash. The density of this coke is *greater* than that of wood charcoal, being found to range from nine hundred and thirteen to one thousand and forty."

The objection often urged, as regards iron ships of war in action, that the splintering is so great that this material cannot be safely used, is met by the assertion that the evil arises entirely from one cause, — that of iron being made mostly by sulphurous fuel. *Iron made with peat charcoal will not splinter.*

We have seen it mentioned, that, in some parts of England, horse-shoes made with peat are considered so much more durable than those manufactured with any other fuel, that nearly double the ordinary price is paid for them.

M. Bussou de Maurier, *à propos* of the prizes of three thousand francs, offered by the Société d'Encouragement of Paris, in 1855, for the best process by which a fuel adapted for household and manufacturing purposes may be economically prepared from peat, notified that society to the effect that he had succeeded in preparing an excellent solid, compact, and tenacious charcoal, or rather coke, by distilling peat mixed with small bituminous coal.

This coke, he says, is admirably adapted for the forging of steel and other metallurgical operations.

A paper of considerable interest and importance appeared in the "London Times," soon after the International Exhibition of 1862, upon the distinct varieties of fuel, peat, and coal, of which several specimens were there exhibited.

Not much was to be learned from the display of mere lumps of raw peat; yet there were several illustrations connected with peat, of great practical value.

Peat is applied as fuel in Great Britain in the smelting of lead in the "ore hearth." This method is extensively employed in the north, and, in the case of rich ores, is maintained by some experienced smelters to be superior to every other.

It is a singular circumstance, that in former times it was practised successfully in Derbyshire, where it became extinct; and that attempts to re-introduce it have signally failed.

In Bavaria, peat-bricks are extensively used under locomotive boilers; and, in Sweden, Ekman has long employed peat in his gas-welding or reheating furnaces. It is fashioned into bricks, and subsequently dried by artificial heat, at a temperature almost sufficient to cause incipient charring.

In the Swedish department were specimens of iron manufactured in such furnaces, with prepared peat as the fuel, by Baron Hamilton, Nericia, at whose works the annual consumption of peat for this purpose is between six hundred and seven hundred tons.

In the Italian department, Gregorini exhibited steel made in a gas puddling furnace, with peat and lignite as fuel.

Furnaces constructed on this principle, whether for the use of peat or other kinds of fuel, are recommended as worthy the attention of our iron-masters and other practical metallurgists who are interested in economizing fuel.

The Moulded Peat Charcoal Company, at this exhibition, "show a material of apparently excellent quality; but, without satisfactory statistics on the economy of the processes by which it is produced, the jury could not pronounce upon it."

The jury (1862) gave an honorable mention to Mr. J. Brunton. "His statements as to employment of the condensed peat on a large scale referred only to a very short period, and were considered as requiring further confirmation."

Mr. W. E. Newton, in 1862, before the Society of Arts, said that peat, if properly prepared and properly used, gave a calorific power equal to, if not greater than, coal; but the use of peat in manufactures was of greater importance than simply as a fuel for heating-purposes. A great many experiments, more particularly on the Continent, had been made with peat as a fuel for metallurgic purposes, and it had been found that it produced iron of very superior quality. He had seen specimens which came up to the best quality of Swedish iron. Every iron manufacturer knew, that if he could get peat to stand the blast, then it was infinitely superior to coal for those purposes, for the simple reason that it contained no sulphur. They could produce iron with peat, from the worst brands, which would almost equal the best Swedish or Russian iron, simply owing to the absence of these deteriorating chemical agents which existed in coal.

Mr. Sanderson of Sheffield, in a report made to an English company, says, —

"You are certainly the first who have succeeded in smelting iron ores in a blast furnace with peat *alone* as a fuel; and I am convinced that you have thereby opened out a large field of industry both for England and Ireland, as well as Scotland, and doubtless other countries.

"All iron metallurgists have agreed in one opinion, that if peat by any means could be produced of sufficient *density* to enable it, when charred, to stand the blast necessary for the production of iron, the iron so produced would be of a very superior quality. Some have thought it would be even superior to iron made with wood charcoal. You have most fully succeeded in obtaining this density in your peat fuel. Indeed, I have seen samples, taken from the bottom of your furnace, which had been subjected to a high heat from forty to fifty hours, perfectly hard and strong. The sample of pig-iron which I have received, and tested for malleable iron, is very satisfactory. As you progress and produce grayer pig-iron, and further manufacture it into malleable iron, its superior quality will be appreciated for cables, boiler-plates, armor-plates, wire, and all other kinds of iron requiring more than ordinary strength. Do not allow yourselves to suppose that you have already produced iron of the value and quality which you will be able to produce when proper appliances are brought to bear upon what you have already done."

Mr. Fothergill, when reporting on experiments with peat charcoal iron conducted under his supervision at Messrs. Platt's iron-works, at Oldham, says, —

"I have no hesitation in stating that the experiments were a great success. The directors can judge of the tenacity and quality of the iron, from the severe character of the test to which it has been submitted; namely, having been completely doubled over *when cold*, without exhibiting a single crack. I deem it my duty to assure the directors, that I am fully aware of the important position in which they are placed; yet I have no hesitation in saying, that I have every confidence in their ultimate success: and the opinions I have previously expressed as to the importance and value of the undertaking remain not only unchanged, but considerably strengthened, by the results of the experiments referred to."

Messrs. Brown and Lennox certify, that the strength of the peat charcoal iron, proved by them in the ordinary manner, is considerably above the average strength of iron of the best brands. The latter testimonial is especially valuable, considering the disadvantage necessarily attendant on smelting iron in a new furnace with new materials.

Professor Emmons, Geologist to the State of New York, concludes some remarks on the subject of peat as follows: "I shall state only one more application of this material; viz., as a substitute for charcoal in the reduction of iron. The coal which is formed from it is equal to any coal: hence it may become of great importance in those sections of country where fuel is scarce, or as it furnishes a resource in this important business when the ordinary means are expended."

It is an acknowledged fact, that peat produces an *intense* heat. Its virtue in this respect is much increased when properly prepared, solidified, and dried; and it reaches its maximum of heating power when solidified and *charred* or *coked.* An interesting article on the "Calorific Value of Fuel," recently published in the "Railway Times," contains some remarks so pertinent on this point, that we quote a few paragraphs: —

"There are in all five important kinds of fuel only: these are wood, peat, coal, charcoal, and coke; the three first being natural, and the two last artificial, fuels. The elements of which each of these is composed are practically identical, the differences of character being due to the proportion of those elements entering into the composition of each kind of fuel; and, according to those proportions, each fuel takes its relative position in the scale of value. Taking the comparative chemical composition of the various kinds of fuel, according to Dr. Machaltie, their percentage stands thus: —

	Carb.	Hyd.	Oxyg.	Nitr.	Sulp.	Ash.
Wood (dried at 280° F.)	50.0	6.0	42.0	1.0	..	1.0
Peat (dried at 220° F.)	57.0	5.5	31.0	1.5	..	5.0
Coal,	85.0	5.0	4.0	1.0	1.0	4.0
Charcoal,	87.0	3.0	7.0	..	..	3.0
Coke,	92.0	..	..	..	1.5	6.6

"The *amount* of heat produced by fuels in their combustion does not always constitute their relative value. For some purposes, such as the production of steam, this would be the best criterion: but as a rule, in metallurgic processes, the *quantity* of heat is of far less importance than the *intensity*, or power to raise substances to the highest temperature; and the fuel which affords the greatest quantity of heat is sometimes incapable of producing the greatest intensity.

"In determining the intensity of the heat produced, it is necessary to know the available quantity of heat produced in the combustion of a pound of fuel, the weight of the products of combustion, and the quantity or number of units of heat required to raise the products of the combustion of a pound of fuel one degree Fahrenheit.

"Where very high temperatures are required, the fuel which should be selected ought to approach as near as possible to pure carbon in its composition, and for the reason that carbon is the best substance for the purpose.

"We now see the reasons for making coal into coke, and wood into charcoal. Coal cannot produce a temperature equal to that obtained from coke, neither can the temperature of wood be compared with that of charcoal. And this results from the relative accession of carbon, and reduction of oxygen and hydrogen in them. This must be referred to the great difference between *quantity* and *intensity* of heat. If we cannot raise sufficient steam from a boiler by the use of one ton of coal, we can easily meet the point by burning two tons; but if the fusing point of metal cannot be attained with one ton of coal, it by no means follows that any additional amount of fuel will insure the required result. The great distinction to be observed is between *quantity* and *intensity* of heat. The first of these two conditions depends upon the quantity of fuel; but the last is referred entirely to the quality of fuel.

"Twenty tons of coal will not give a temperature as great as that afforded by one ton of coke."

PEAT AS APPLIED FOR GENERATING STEAM.

Sir R. Kane, before quoted in these pages, stated, in 1844, that the steamers plying between Limerick, Clare, and Kilrush, in Ireland, were using peat for fuel. The "Garry Owen" steamer made the passage between Kilrush and Limerick, fired with turf (although in the midst of a coal region), in three hours twenty minutes: distance, about forty-five miles. The Shannon steamers were mostly using it; and its consumption in mills, factories, workshops, as well as for domestic purposes, was steadily increasing.

Some years since, a patent was obtained by Mr. Williams, managing director of the Dublin Steam Navigation Company, for a method of converting the lightest and purest beds of peat moss or bog into the four following products, each of which possesses very valuable properties: —

1. A brown combustible, solid, denser than oak.
2. A charcoal twice as compact as that of hard wood.
3. A factitious coal.
4. A factitious coke.

One of the most important results ascertained with these products was, that, with ten hundred-weight of the factitious coal, the same steam-power was obtained in navigating the company's ships as with seventeen and a half hundred-weight of pit coal alone; thereby saving thirty per cent in the *stowage* of fuel.

Mr. d'Ernst, artificer of fireworks at Vauxhall, proved, by the severe test of colored fires, that the turf charcoal of Mr. Williams was twenty per cent more combustible than that of oak.

Mr. Oldham, engineer of the Bank of England, applied it in softening his steel plates and dies, with remarkable success. Mr. Williams's method of preparing the peat was given as follows: When freshly cut, the fibre of the peat is broken up, and the mass is placed between cloths and pressed by a powerful hydraulic press, which condenses it to one-third of its original volume, and to three-fifths of its weight, through the loss of moisture. This condensed peat, when carbonized, gives a fine coherent coke of about three-tenths the weight of the turf as cut; burns freely, producing intense heat, and leaving only a very small percentage of ash. Its density is greater than wood charcoal, and the cost of production is about twenty shillings per ton.

Mr. Brunton, before the Society of Arts, in 1862, called attention to the fact, that trials with his prepared peat, upon a sufficient scale, under the boiler of an ordinary steam-engine of twenty-horse power, had demonstrated that the peat, as a heating power, did two and one-third times the duty of coal. The ordinary consumption of coal in the furnace was twelve cwt. per hour. An equal quantity of his prepared peat lasted two hours and twenty minutes, producing the same amount of steam per hour, and doing the ordinary work of the engine.

Mr. Paul, in the paper we have before referred to, says, "As regards the use of peat for fuel, it now remains only to consider what are the circumstances under which it can be used for this purpose, and under which there is an advantage in using it rather than coal.

"I can best illustrate this by a case within my own experience. During the last four years, I have had occasion to manufacture a large quantity of bricks in one of the Western Islands of Scotland, and for that purpose required fuel for raising steam to drive the brick machinery, and for burning the bricks. Coal could be delivered at the works, including 4s. for cartage, at 22s. per ton: but I found that the peat, of which there was abundance close to the works, was capable of raising steam well, and of being used for burning the bricks, and that I could for 8s. put down at the boiler, or at the kiln, a quantity of peat equivalent to one ton of coal; thus making a difference of 14s. between the use of a ton of coal and the use of a quantity of peat equivalent to it. This was equivalent also to a saving of 7s. per thousand in the cost of the bricks. The advantage would have been still greater had there been more efficient means for bringing in the peat from the moor, which, as it was in this case, cost as much as the peat on the moor, or about 2s. per ton.

"The applicability of peat for the purpose of fuel on board steamers is indubitable. I have employed peat as the only fuel for steam-boilers during the last four years, and have found it to answer admirably. It has also been tried by Mr. James Napier, of Glasgow, on board his steamer, the 'Lancefield;' and he is of opinion that it might be used in the place of coal."

Professor Emmons, in a report to W. H. Seward, Governor of New York in 1839, says, "I have been informed that peat, as a fuel for steam-engines, has been proved, by actual experiment, of great value. To impart to it the power of emitting, during combustion, a lively flame, a small quantity of tar is mixed with it, which, of course, creates a larger volume of flame, which is a matter of considerable moment when employed in generating steam. The experiments referred to were made on board the "Great Western" during her last passage; and such was the result, that a large amount of peat was taken on board for her homeward passage."

From the "London Engineer" we learn that "a paper was read by Mr. P. F. Nursey, before the Society of Engineers, at Exeter Hall, which contained some interesting and valuable information. The paper alluded to the probability of an exhaustion of English coal-fields, owing to the increasing annual consumption, which, between the years 1850 and 1860, was at the rate of two and three-fourths million tons. . . . The question of peat was considered at some length. The author, considering the subject of great importance, had collected much important information.

"The deposits of peat in Great Britain and Ireland were stated to occupy an area of about six million acres, and to vary in thickness from two feet to fifty feet; and, at an assumed average of twelve feet, an acre would yield about 3,500 tons of dried peat, or a total quantity of 21,000,000,000 tons. The process of manufacture of 'condensed peat' was fully detailed. It was shown that the cost of the fuel produced did not exceed that of coal at the pit's mouth. It was shown to possess qualities superior to coal, especially its heating power. Trial of the condensed peat had been made by Mr. B. Fothergill on a river-steamboat, in which twelve cwt. were consumed in two hours twenty minutes, the ordinary consumption of coal being twelve cwt. per hour. The heat gave no smoke, and left no clinkers. The locomotive engineer of the Belfast and Northern Counties Railway had tried the condensed peat on that line. In a trip of seventy-four miles, the total quantity of fuel burnt was fourteen cwt., one quarter, fourteen lbs.,—the train, including engine and tender, weighing seventy tons. The time occupied was three hours, nine minutes. The trial proved satisfactory. An analysis of the peat by Mr. Rickard was given, which showed it to contain but a trace of sulphur, and no phosphorus, which rendered it peculiarly adaptable for iron-smelting and other purposes, where the presence of either of those bodies was so pernicious.

"Particulars were given of an experiment, on a practical scale, by Mr. G. Murrall, at the Creevelea Iron Works, Leitrim, in which condensed peat was used for smelting iron ore. The iron was equal to any charcoal iron. It was tried by Mr. An-

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derson, C. E., whose report showed the strength of the iron to be forty per cent above ordinary Scotch pig.

"The peat was also tried in a puddling furnace, at the Mersey Steel Works; and the iron produced therefrom was drawn into tubes and T irons, — a very high test.

"The question of producing gas was gone into, and experiments by Mr. Jones and Mr. Versmann, the former engineer, and the latter consulting chemist to the Commercial Gas Co., were detailed, and tables of results given, which showed the superiority of condensed peat over coal in this particular. It was proved to yield a larger quantity of gas in a shorter time than coal.

. . . "The author concluded by observing that the question of fuel was a most important one, especially so in its economical bearing; and expressed a hope that the merits of peat, as a fuel, would be allowed to weigh, that the subject might be investigated with that vigor to which it was entitled."

The following is abridged from the "London Mechanics' Magazine:" —

The upper portions of a peat-bed abound with roots and coarse fibres, and produce an inferior fuel, which will not stand the blast nor make good charcoal. To make good fuel, the roots must be removed and the smaller fibres broken up. A machine does this, and makes "condensed" peat, which burns freely, bears a strong blast, gives great heat, is smokeless, and leaves less ash that average coal or coke. Two and a half to three tons of peat make one ton of excellent charcoal. The heating power of condensed peat has been proved to be superior to that of coal; and it is well adapted to steam-engines, marine, stationary, or locomotive. It saves half the time of getting up steam, and will do double duty as compared with coal. The absence of smoke and clinkers, and the preservation of the grates and fire-boxes from the effects of sulphur, are important additional advantages. This peat has been tried on a river-steamer with success. The vessel was under steam 2h. 20m., during which time only 12 cwt. was burnt, the average consumption of coal being 12 cwt. *per hour;* and in this case the full effect was not obtained, as the grate-bars were too far apart for peat, and a portion fell through.

The locomotive superintendents of three railways in Ireland made a trial of condensed peat, on the Belfast and Northern Counties Railway, to test its fitness for locomotives. During a trip of twenty-seven miles there was an excess of steam, though the fire-door was continually open, and the damper down, for the greater part of the distance. The pressure at starting was 100 lbs. The commencement of the trip was up an incline of 1 in 80, four miles long, with double curves. While ascending this incline the pressure rose to 110 lbs., and afterward to 120 lbs., with the fire-door open. The speed was forty miles per hour. While running, there was no smoke, and little at the stations. The fire-box was examined at the end of the trip, and very little clinker was found; and the smoke-box was free from cinders and dust,—a proof that the fuel had stood the blast well; and it is the recorded opinion of the experimenters, that the peat was, in every respect, well suited for locomotives.

In view of such facts, the wonder is that it has not come into use. One reason why it has not may be in the limited quantity made for steam-purposes, the greater value of peat lying in its conversion into charcoal, for which it is used with the best results. Another cause may be the reluctance to leave the beaten track.

This substitute for coal deserves attention in connection with the working of underground railways. It is agreed that a radical change must be made in the motive-power; that even Mr. Fowler's new engine must be superseded by one having no fire at all; and that the engine must contain water already heated to a temperature necessary to produce a sufficiency of steam to work the required distance without combustion in the tunnel. In this extremity, why not try the fuel which did so well on the Irish railway trip? The absence of smoke and sulphurous vapor should be a sufficient inducement, independent of the economy that is very probable.

An experiment has recently been make on the New-York Central Railroad by using peat instead of coal. The result was highly satisfactory. The usual amount of fuel consumed by coal-burning engines is a ton to every twenty miles; but in this instance only half a ton was used. Railroad-men are said to have considered it a success.

For *gas*, its properties have been tested in several places in this country, as also in Paris, Plymouth, Dartmoor Prison, Dublin, and other places in Europe, with uniformly satisfactory results, but varying considerably, according to the character of the crude material. Its yield may be said to be about the same as the Newcastle coal ; but, in most cases, the light produced has been pronounced superior in brilliancy and power.

Gas of an excellent quality for lighting, and in large quantities, can be produced from some kinds of peat ; and in the ordinary progress of events must, we think, be extensively used, and that at no distant day. Numerous and very successful experiments in this direction have been made, and results published from time to time. As long ago as 1683, J. J. Beecher published an account of his having produced gas from common coal in England, and from peat in Holland ; and, from that time to the present, abundant proof of its value and easy production has accumulated.

For purposes of making and refining iron, the gas produced from peat has been extensively used in France, Germany, Prussia, and Sweden. In many places in Europe it is used for both purposes, and its consumption is regularly augmenting.

On Dartmoor, the peat is cut by the convicts from the prison, working in gangs ; and, after being dried, it is carefully stored in one of the old prisons. From this peat, by a most simple process, gas is made with which the prisons at Princetown are lighted.

The illuminating power of this gas is very high. The charcoal left after the separation of the gas is used in the same establishment for fuel and for sanitary purposes, and the ashes eventually go to improve the cultivated lands of that bleak region.

Attempts were made here many years since to distil the peat for naphtha, paraffine, &c. ; but, the experiments not proving successful, the establishment was abandoned.

An article in " Silliman's Journal," 1855, after remarking upon discussions had in the city of Paris in connection with the renewal of the engagements of the city with the gas companies, goes on to say, "Attention has been called to the gas manufactured from peat, which for some time has been manufactured in Paris.

"M. Foucault has been charged with measuring the comparative illuminating powers of coal and peat gas; and the result is in favor of that of peat, its power being three hundred and forty-two, while that of coal gas is one hundred. The manufacture of peat gas is also more simple than coal. The peat, if put into an iron retort, heated to a low red-heat, affords immediately a mixture of permanent gases and vapors, which condense into an oleaginous liquid, which two products separate on cooling. The oil is collected in a special vessel, and the gas passes into a gasometer. This carburetted hydrogen is wholly unfit for illumination; it giving a very small flame, nearly like that from brandy. The oil from the peat is a viscous, blackish liquid, of a strong odor. It is subject to a new distillation, and resolved wholly into a permanent gas and hydrogen very richly carburetted. This mixture is strongly illuminating; giving a flame six or eight times brighter than the first, and of a more lively brilliancy. The two are mixed, and a gas of intermediate character obtained, which is delivered over for consumption.

"M. Foucault made his trials with a photometric method not then made public. Its unit was not a single wax-candle, but a collection of seven candles, arranged in a hexagonal manner, with spaces of one centimeter. A single candle is liable to too much variation, a compensation for which is secured when a number are employed. By this method, a mean of five determinations gave for a burner of peat gas a light equivalent to twenty-three and one-fourth candles; and the same burner with coal gas, six and three-tenths candles.

"The illuminating power of the pure oil from peat, the illuminating material, *par excellence*, has been found at equal pressures seven hundred and five, the intensity of coal gas being one hundred; and, with equal volumes, their numbers are as seven hundred and fifty-six to one hundred."

From the absence of sulphur in peat, the purification of this gas is much more easily accomplished than that from coal.

Mr. Paul, to whom reference has before been made, stated before the Society of Arts, in 1862, that for a long time he had manufactured gas from peat, to light his works; that the bituminous black peat of Scotland produced gas of good illuminating power, which required no purifying process for ordinary purposes; and he considered the applicability of peat for gas-making a matter well worthy of consideration.

Mr. Keats, before the same society, said he had made experiments of a like character, and had obtained as much as ten thousand cubic feet of gas from a ton of peat; but the percentage of carbonic acid was so great, in some cases amounting to twenty-two per cent, that it amounted to a prohibition of the use of the gas until some cheap means for removing that difficulty should be found.

Mr. Brunton stated that trials made with his prepared peat had shown not only that there was a large amount of gas in the peat, but that the gas was of such high illuminating power as to bear advantageous comparison with gas distilled from coal; while the difficulty of the carbonic acid gas was done away with, in a great measure, by the partial charring or baking of the peat before it was used for the manufacture of gas.

Mr. Versmann had conducted experiments, and came to the conclusion that this prepared peat was a most valuable material for gas-purposes, and that it would produce from twelve thousand to fourteen thousand cubic feet of gas per ton, of an illuminating power exceeding that of ordinary coal gas, the amount of carbonic acid not exceeding ten per cent; and although that was somewhat in excess of the average of coal gas, yet there were advantages in peat which more than counterbalanced the disadvantages arising from the excess of carbonic acid.

Professor Emmons, in his Report on the Geology of New York, remarks upon peat, and says, "It contains a gaseous matter equal in illuminating power to oil or coal gas."

And again: "Peat furnishes an abundance of carburetted hydrogen, and hence may be employed for producing gas-light. Dr. Lewis Feuchtwanger, of New York, has made known to the American public the experiments of Merle, a director of a gaslight company in France. The advantages of peat for the production of gas are as follows: 1st, It is less expensive than gas from coal, oil, or resin. 2d, The produce is nearly as much as from those substances. 3d, The gas is quite harmless and inoffensive, and has, in respect to healthfulness, great advantages over some of the other kinds of gas. After it has been employed for gas, it may be used for fuel, and is equal to any charcoal.

"If the above details may be relied upon, and if the experiments of Merle are satisfactory, if peat can be employed to advantage in the production of gas, it becomes one of the most important natural productions in the State, second only to coal for fuel, and equal to it for producing a beautiful and agreeable light. It would at once become a source of individual wealth, and furnish employment for a multitude of laborers, and increase the amount of transportation from the interior of the State to the cities and larger villages. It would employ a vast amount of material lying useless and unproductive, and one, too, embraced in our own territory. It would be using a great capital which has been accumulating for a long time, and has been reserved in store for this age of enterprise."

CHEMICAL PRODUCTS FROM THE DISTILLATION OF PEAT.

In 1849, public attention in England was very much excited by an extraordinary statement made in the House of Commons by Mr. Mahon, and supported by Lord Ashley, asserting the immense area of bog in Ireland to contain substances of great economic value, to be produced at comparatively small cost. Lord Ashley's statements were based upon the authority of Mr. Owen, whose experiments went to show, that, chemically treated at remunerative cost, the product would be the following substances, — carbonate of ammonia, soda, vinegar, naphtha, paraffine, camphine-oil, common oil, gas of value, and ashes.

The publication of this remarkable statement was quickly followed by a letter in the "Times," from Mr. Henry Seaman, of Plymouth, asserting that he and his neighbors lost £20,000 in an attempt to turn the peat-bogs of Dartmoor to profitable account, in the same manner as the peat of Ireland had been treated by Mr. Owen and his partner.

This letter was followed by one from Mr. Robert Oxland, a practical chemist, residing at Plymouth, who rather confirmed the principal parts of the statement made by Lord Ashley.

Subsequently the whole matter was taken up and thoroughly dissected in an article in the "Illustrated London News," No. 384, from which we quote a single paragraph: "No doubt a fair marketable value is taken for the several items; but we believe, and we express this most conscientiously, that the cost of production would exceed their commercial worth."

Again: in November, 1850, in the "Times" is found the following statement: "It now appears that Mr. Owen, whose course, from the first, was in no way inconsistent with Lord Ashley's testimony respecting him, has been, for the past year and a half, quietly engaged in testing the merits of the process, to an extent that would properly authorize a definitive estimate of its results. These labors have been carried on partly under the superintendence of Dr. Hodges, the Professor of Agriculture in Queen's College, Belfast; and partly in the neighborhood of London, at the premises of Messrs. Coffey & Sons, engineers; and the conclusions now represented to have been arrived at are of an exceedingly satisfactory nature. They do not promise the five hundred per cent originally talked of; but, according to a certified estimate rendered by Messrs. Coffey & Sons, they show a profit of upwards of one hundred per cent.

"This estimate, which is framed for an establishment consuming 36,500 tons of peat per annum, is as follows: —

EXPENDITURES.

"36,500 tons of peat, at 2s. per ton	£3,650
455 " " sulphuric acid, at £7	3,185
Wear and tear of apparatus, &c.	700
Wages, labor, &c.	2,000
Cost of sending to market, and incidentals	2,182
Profit	11,908
	£23,625

PRODUCE.

365 tons sulphate of ammonia, at £12........	£4,380
255 " acetate of lime, at £14	3,570
19,000 gallons naphtha, at 5s	4,750
109,500 lbs. paraffine, at 1s	5,475
73,000 gallons volatile oil, at 1s	3,650
36,000 " fixed oil, at 1s	1,800
	£23,625."

After referring again to the experience of Sir Robert Kane, as given in his "Industrial Resources of Ireland," and the experiments made by the Dartmoor Company on a large scale, the "Times" says, "We wish these results may be realized; but we have no hope of any thing so satisfactory."

Professor Brande read before the Royal Institution, in 1851, a paper upon peat and its products.

Special mention was made of the "tallow-peat" of the banks of Lough Neagh, which, from the brilliant flame attending its combustion, has been used for illuminating purposes as well as for fuel.

He says, "Peat may be rendered valuable either from the charcoal which may be obtained from it, or by various products derivable from what is called its destructive distillation.

"When it is desired to convert peat into charcoal, the plan adopted by the Irish Amelioration Society is to carbonize blocks of peat, partially dried on trays of wicker work, in movable pyramidal furnaces. The charcoal so obtained varies in character with that of the peat which produces it; and, when the peat is compressed previous to its carbonization, the resulting charcoal exceeds the density of common wood charcoal.

"The efficacy of this charcoal in the manufacture of iron, in consequence of the small quantity of sulphur it contains, was mentioned, and its deodorizing and purifying qualities experimentally exhibited.

"The elements of peat are essentially those of wood and coal; viz., carbon, nitrogen, hydrogen, and oxygen."

In conclusion, Professor Brande reviewed the various products of peat derived by distillation, and their uses. They appear to be,—

1. Sulphate of ammonia. This substance is employed in the preparation of carbonate and muriate of ammonia, of caustic ammonia, and in the manufacture of fertilizing composts.
2. Acetate of lime, which is in constant demand as a source of acetic acid, and of various acetates largely consumed by calico-printers.
3. Pyroxylic spirit (or wood-alcohol), used in vapor-lamps, affording a brilliant light, and for the preparation of varnishes.
4. Naphtha, used for making varnishes, and for dissolving caoutchouc.
5. Heavy and fixed oils, applicable for lubricating machinery, especially when blended with other unctuous substance, or as a cheap lamp-oil, and as a source of lamp-black.
6. Paraffine. This article is largely used for the manufacture of candles.

An article in the "Annual of Scientific Discovery" for 1851, relating to improvements in treating peat in England, says, "In addition to gas and ammonia, he also obtains from the distillation of peat a peculiar acid, and a bitumino-adipose compound, which he calls 'paranaphthadipose.' One of the products of this is a good solvent of gutta-percha, caoutchouc, &c."

The crude residues from the rectification of the oils of peat and bitumen, if burned in proper apparatus, furnish abundance of lamp-black.

A writer in the "London Journal of Arts" for December, 1855, states that the peat charcoal which is left in the retorts, after all the volatile constituents of peat have been distilled away, possesses the property of depriving colored vegetable solutions of the whole of their coloring-matters. He adds that twenty-five per cent more of this charcoal is needed than of bone-black; but the latter is about six times as expensive. Before using the peat charcoal, it must be purified from iron, and sulphate of lime, and all alkaline matters.

In 1854, a company was formed, called the Irish Peat Company, having a factory near Athy, in Kildare, Ireland; its purpose being to produce, from peat, tar, paraffine, oil, naphtha, sulphate of ammonia, and to manufacture iron, the furnaces being heated with the gas manufactured or produced from the peat. It was under the general management and superintendence of Dr. Sullivan. The peat was distilled in furnaces like the ordinary blast furnaces, thirty-two feet seven inches high, made perfectly tight by being incased in boiler plate iron, and covered at the top with a close conical valve and a double hopper. Air was blown in, in limited quantity, through three tuyères at the base. The volatile products were taken off at the top by two twelve-inch pipes, and conveyed into an hydraulic main three feet in diameter, from which the tar and other liquids flow into a tank, and the gases and vapors through series of condensing and purifying pipes and other apparatus, in which their separation is effectually completed. The charcoal is entirely consumed in the furnace. Various experiments gave great encouragement to the company; and the projectors, who were men of considerable standing and eminence, were sanguine of success. They started their works, however, at immense cost, and with the intention of producing *every thing* from peat, in paying quantities, and consequently failed. It was well known, moreover, that the original outlay for building, machinery, &c., was enormous (something like $300,000), and the peat operated upon was of an inferior quality: the result of the enterprise, therefore, is no criterion for the commercial results of a prudently managed establishment.

Probably one of the reasons why several of the peat enterprises which have been started have met with so little real success has been from the fact that they wanted to do too much. If people will undertake to obtain in one establishment all the products capable of being derived from peat, the probabilities are that they will fail of profit, and make a loss; but an establishment devoted exclusively to the preparation of peat as a fuel, leaving others to char or distil it, will probably succeed commercially.

Mr. B. H. Paul read to the British Association, in 1863, a paper "On the Manufacture of Hydro-carbon Oils, Paraffine, &c., from Peat."

The author described the results which had been obtained at some works erected under his direction, at Stornway, on the Island of Lewes.

The peat of that locality was described as a peculiarly rich bituminous variety of mountain peat, yielding from five to ten gallons of refined oils and paraffine from the ton. The results obtained at these works were contrasted with those obtained at the works of the Irish Peat Company, where the produce of oil was not more than two gallons per ton. This difference in the produce was ascribed, in a great degree, to the improper mode of working adopted at the Irish works.

One of the most important points dwelt upon was the necessity of regarding the hydro-carbon oils and the paraffine as the only products that would afford a profit in the distillation of peat. Dr. Paul concluded his paper by expressing his opinion, that, though the working of peat was surrounded by many serious difficulties, there was every reason to believe that such peat as that occurring in the Highlands of Scotland could be advantageously worked; and that, if the manufacture of oils were undertaken with earnestness and perseverance, it would become the means of greatly improving the condition of those parts of the country, and a fertile source of profit.

In a recent conversation with a gentleman of this city, a native of Germany, he gave a very interesting account of a large peat establishment near his father's residence, "as large," he remarked, "as Chickering's Factory," where the products above mentioned are produced on an extensive scale, yielding, according to his statements, large profits to the proprietors of the works. He mentions also another production realized at these works, of which we have nowhere seen mention in connection with peat. We allude to *aniline colors*, which he states are there produced from peat, though in very small quantities; but, owing to their exceeding richness and strength, are sold "so many drops, so many dollars," which, being interpreted, means one dollar per drop. The finest candles used in the Catholic service in that country are manufactured from paraffine extracted from peat.

PEAT FOR PAVEMENTS.

The solid bitumen from the distillation of peat may be employed, like asphalt, in the preparation of mastic for paving; and experiments have shown that peat itself may be converted into a similar material by the following process: Having been well dried, it is mingled with from ten to fifteen per cent of coal-tar, and the mixture boiled for several hours, until the peat dissolves into a viscid liquid, which, when cooled, is solid, and resembles asphalt.

Another account says, —

"For *pavements*, when combined with an artificial asphaltum composed of carbonate of lime and coal-tar, it is said to form a solid and elastic road, superior, in many respects, to native asphaltum. The tendency of this artificial asphalt to crack and break is counteracted by the strong fibre of the peat; which, if added to the chalk and tar while warm, acts as a binder when the mass is cooled, and obviates its brittleness."

PAPER FROM PEAT.

J. Lallemand, of Besançon, France, procured, in 1854, a patent for producing paper from the fibrous portions of peat, mixed with from five to ten per cent of rag pulp, the peat having been treated by a peculiar process described by him; after which the mixture is subjected to the other common processes for making paper.

PEAT IN GUNPOWDER.

For the production of *gunpowder*, many varieties of peat are superior to the charcoal of dogwood and alder. We have seen the black peat of Massachusetts so perfectly prepared and granulated, without any explosive admixture, that it was impossible to distinguish it from the best rifle powder, even by a well-practised eye.

PEAT FOR BUILDING AND ORNAMENTAL WORK.

During the past season, we have several times suggested that the characteristics of peat were such that it required but little ingenuity to make use of it for building, ornamental, and other purposes, in the same manner as, or as a substitute for, terra-cotta and papier-maché.

More recently, a paragraph has been shown us, cut from the "Builder" (1860), stating that improvements in manufactures of peat had been patented by Mr. H. Hodgson, of Ballyreine and Merlin Park, and Mr. P. M. Crane, of the Irish Peat Works, Athy; which consist in preparing from peat, in its natural state, blocks, slabs, or pieces of any size, form, or thickness, which, when so prepared, are said to be useful and economical in the construction of parts of buildings, and for various other purposes.

These blocks are placed between cloths of woven or textile fabric, or other suitable material; and the peat is placed between shelves, and submitted to hydraulic or other pressure. The water is entirely forced out, and the peat solidified; and drying is effected either by exposure to the atmosphere or in a room heated artificially, or by any other process. They are then put again between the plates of an hydraulic or other press, and extreme pressure put on them.

If the product of this invention be required for use for inside work in building, such as partitions, linings, inside roofing, or for other work, as a non-conducting substance, they do not require other further preparation than shaping, provided they are not to be exposed to wet. But the slabs or pieces used for roofing (instead of slates, tiles, or other things of that nature) they prepare to resist the wet or action of the atmosphere, by steeping them in, or saturating, or coating them with, some fitting material to resist moisture.

Toys, fancy articles, and even rings and jewelry, have been produced from peat, and have much the same appearance as the same articles made from India-rubber.

ANTISEPTIC PROPERTIES OF PEAT.

We have had occasion several times to refer to the antiseptic properties of peat. On this subject, Prof. Lyell, whom we have before quoted, says, —

"One interesting circumstance attending the history of peat-mosses is the high state of preservation of animal substances buried in them for periods of many years. In June, 1747, the body of a woman was found six feet deep in peat, in a peat moor in the Isle of Axholm, in Lincolnshire. Upon the feet were leathern shoes, or sandals, each cut out of a single piece of tanned ox-hide, folded about the foot and heel, and piked with iron. Such are described by Chaucer as being worn in his time. This certainly afforded evidence of her having been buried there for many ages; yet her nails, hair, and skin are described as having shown hardly any marks of decay. In a turbary on the estate of the Earl of Moira, in Ireland, a human body was dug up, a foot deep in gravel, covered with eleven feet of peat: the body was completely clothed, and the garments seemed all to be made of hair. Before the use of wool was known in that country, the clothing of the inhabitants was made of hair; so that it would appear that this body had been buried at that early period: yet it was fresh and unimpaired. In the Philosophical Transactions, we find an example recorded of the bodies of two persons having been buried in moist peat in Derbyshire, in 1674, about a yard deep, which were examined twenty-eight years and nine months afterwards: 'The color of their skin was fair and natural; their flesh soft as that of persons newly dead.' "

In Dr. Rennie's Essays, reference is made to several other instances of like character.

" Among other analogous facts, we may mention, that in digging a pit for a well near Dulverton, in Somersetshire, many pigs were found in various postures, still entire. Their shape was well preserved; the skin, which retained the hair, having assumed a dry, membranous appearance. Their whole substance was converted into a white, friable, laminated, inodorous, and tasteless substance, but which, when exposed to heat, emitted an odor precisely similar to broiled bacon.

" We naturally ask whence peat derives this antiseptic property. It has been attributed by some to the carbonic and gallic acids which issue from decayed wood, as also to the presence of charred wood in the lowest strata of many peat mosses; for charcoal is a powerful antiseptic, and capable of purifying water already putrid. Vegetable gums and resins also may operate in the same way. Dr. Macculloch suggests that the soft parts of animal bodies, preserved in peat-bogs, may have been converted into adipocere by the action of water merely.

"The Solway Marsh is a flat area, about seven miles in circumference, situated on the confines of England and Scotland. It is related that at the battle of Solway, in the time of Henry VIII. (1542), when the Scotch army, commanded by Oliver Sinclair, was routed, an unfortunate troop of horse, driven by their fears, plunged into this morass, which instantly closed upon them. The tale was traditional; but the fact, that a man and horse in complete armor were actually found by peat-diggers in the place where it was always supposed the affair had occurred, tends to authenticate the story. The skeleton of each was well preserved, and the different parts of the armor were easily distinguished.

"This same moss, on the 16th of December, 1772, having been filled with water during heavy rains, rose to an unusual height, and then burst. A stream of black, half-consolidated mud began at first to creep over the plain, resembling, in the rate of its progress, an ordinary lava current. No lives were lost; but the deluge totally overwhelmed some cottages, and covered four hundred acres. The highest parts of the original moss subsided to the depth of about twenty-five feet, and the height of the moss on the lowest parts of the country which it invaded was at least fifteen feet." Several other instances of a similar character might be cited.

"The antlers of large and full-grown stags are among the most common and conspicuous remains of animals in peat. They are not horns which have been shed; for portions of the skull are found attached, proving that the whole animal perished. Bones of the ox, hog, horse, sheep, and other herbivorous animals, also occur; and in Ireland, and the Isle of Man, skeletons of a gigantic elk: but no remains have been met with belonging to those extinct quadrupeds of which the living congeners inhabit warmer latitudes, such as the elephant, rhinoceros, hippopotamus, hyena, and tigers, though these are so common in superficial deposits of silt, mud, sand, or stalactite, in various localities throughout Great Britain. Their absence seems to imply that they had ceased to live before the atmosphere of this part of the world acquired that cold and humid character which favors the growth of peat.

"We are informed by Deguer, that remains of ships, nautical instruments, and oars, have been found in many of the Dutch mosses; and Gerard, in his 'History of the Valley of the Somme,' mentions that in the lowest tier of that moss was found a boat loaded with bricks, proving that these mosses were, at one period, navigable lakes and arms of the sea, as were also many of the mosses on the coast of Picardy, Zealand, and Friesland. The canoes, stone hatchets, and stone arrowheads, found in peat, in different parts of Great Britain, lead to similar conclusions."

Professor Lyell, in a work on geology, published in London the present year, says of the peat of Denmark, "In the lower beds of peat (a deposit varying from twenty to thirty feet in thickness), weapons of stone accompany trunks of the Scotch fir; while, in the higher portions of the same bogs, bronze implements are associated with trunks and acorns of the common oak. All the quadrupeds found in the peat agree specifically with those now inhabiting the same districts, or which are known to have been indigenous in Denmark within the memory of man."

PEAT AS A DISINFECTING AND DEODORIZING AGENT, AND AS A FERTILIZER.

Peat is also, when properly prepared, a powerful disinfectant and deodorizing agent; and, as a fertilizer, possesses a value to our farming and agricultural interests beyond what is generally accorded to it. The "Muck Manual," by S. L. Dana of Lowell, published in 1843, is considered standard authority upon this latter point, and will be consulted with interest and profit by our farmers.

ASHES OF PEAT.

The ashes of peat are of very considerable value, and are used to great advantage on some soils, and highly esteemed: they also make a very serviceable cement, and are used to some extent for that purpose. It has been suggested that they would make an excellent polishing powder for lithographic stones, metals, etc.

In view of these statements, thus hastily given, and which have been extended beyond our original plan, although barely sufficient to introduce the subject, it must, we think, be evident to the most hasty reader, that the substance of which we treat is of sufficient importance to command earnest attention, not only from the business-man, on the score of its application to domestic purposes, manufactures, and the arts, but from the philanthropist, in view of the relief it may be made to afford as one of the necessaries of life.

The facts narrated, aside from those derived from personal experience and observation, are collected from a variety of sources; and, in the hope that others may be led to investigate and pursue the subject more at length, we add a list of authorities, from nearly all of which we have drawn something (using freely, in many cases, the exact language of the several writers in connection with our own), in many of which the subject is treated in detail, and in some with great ability: —

Geological Surveys of Great Britain.
Martin's Statistics of the British Colonies.
Lindley and Hutton's Fossil Flora of Great Britain.
McCulloch's Statistics of the British Empire.
McCulloch's Geographical and Statistical Dictionary.
Sullivan's Journal of Industrial Progress.
Kane's Industrial Resources of Ireland.
Ireland and its Economy.
Wakefield's Account of Ireland.
Ordinance Survey, and Report of the County of Londonderry.
Lyell's Principles of Geology.
Dana's Manual of Geology.
Jameson's Mineralogy of the Scottish Isles.
Dr. R. Rennie on Peat.
Ure's Dictionary of Arts, Manufactures and Mines.
Appleton's Dictionary of Mechanics.
Muspratt's Chemistry as applied to Arts and Manufactures.

Encyclopædia Americana.
Encyclopædia Britannica.
New American Cyclopædia.
Brewster's Edinburgh Encyclopædia.
Rees's Cyclopædia.
Encyclopædia Pertheasis.
Encyclopædia Metropolitana.
Tomlinson's Encyclopædia.
Homan's Cyclopædia of Commerce.
Loudon's Encyclopædia of Agriculture.
Buckland on Coal.
Johnson on Coal.
Williams on Combustion of Coal.
Taylor's Statistics of Coal.
Holland's History of Fossil Fuel.
Parkinson's Organic Remains.
Dana's Muck Manual.
Field Book of Manures.
Official Report of the Great Exhibition of the Industry of all Nations, 1851.
Report of the Juries of the International Exhibition of 1862.
Patent-office Reports.
Geological and Agricultural Reports of Nova Scotia, Canada, and the several New-England, Northern, and Middle States.

Numerous miscellaneous articles from —
Silliman's American Journal of Science.
Farmer's Magazine.
London Mining Journal.
Penny Cyclopædia.
Hunt's Merchants' Magazine.
Mining Review.
Philosophical Transactions.
Scientific American.
London Engineer.
Proceedings of Geological Society, London.
Reports of American Institute, New York.
Edinburgh Philosophical Journal.

Annales des Mines.
Association Allemande, faits commerciaux.
Year Book of Facts.
Annual of Scientific Discovery.
Repertory of Arts.
Repertory of Patent Inventions.
Various papers on Fuel, Iron, Gas, Steam, &c.

THE AMERICAN PEAT COMPANY,

OF BOSTON,

Originated in 1864, with several gentlemen largely interested in

RAILROADS AND MANUFACTURING ESTABLISHMENTS

IN NEW ENGLAND,

Consuming, for steam and other purposes, an

IMMENSE AMOUNT OF FUEL.

THEY were convinced that peat, if properly prepared, would prove to be an article of fuel which might serve equally well with coal.

The question was, Could it be so prepared, in sufficient quantities, and at an expense which would warrant its use?

A sum of money amply sufficient to test these questions practically was unhesitatingly subscribed; men of practical experience and familiar with the article, and others of superior mechanical ability, were employed; a favorable location was secured; works were erected; and the whole matter was thoroughly and satisfactorily tested.

The result is a demonstration of the fact, that peat can be manufactured (its qualities as a fuel being very much improved by the process) and produced in large quantities, in good merchantable shape, at a moderate cost, not to exceed four or five dollars per ton.

Moreover, it is shown conclusively not only to "serve equally well with coal," but that for many purposes it is *unquestionably superior*, especially *for generating steam*, and *for the manufacture of iron, steel, and other metals.*

The processes by which the article is cleansed, prepared, solidified, and formed in convenient shape for use, are simple, and are secured to the Company by letters-patent, for their exclusive use.

It will readily be seen that the exclusive right to the only successful mode of manufacture yet discovered in this country, by which an article so abundantly deposited about us can be made available for the supply (superior in quality) of an immense want of our extensive manufacturing establishments, and the motive power on our railroads and steamboats, to say nothing of domestic and other purposes of perhaps minor importance, amounts to a monopoly of no small value.

The purposes of the Company are liberal in their character, and it is their aim to *encourage the manufacture of peat in all parts of the country;* and for this purpose they propose to furnish machinery, and grant rights to manufacture under their patents, at prices and on terms, which, while they are not only remunerative but profitable to the Company, shall be equally so to the purchasers.

It may be proper to state in this connection, that the patents above alluded to cover the whole ground, and have passed the most rigid investigation, not only of counsel here expert in these matters, but, by special request of the parties in interest, they have been carefully examined by Judge Mason, Ex-Commissioner of Patents, at Washington, whose report is decided and conclusive in the matter. He says, "There is nothing in our Patent Office which anticipates this invention, or which stands at all in its way; and after a diligent examination of foreign patents, and works on this subject, I am satisfied that no machine of this kind has ever before been invented for this purpose. The patent is not only valid, but the machine it embodies can be used without infringing upon any patent now in existence."

The Capital of the Company is (2,500 shares at $100) $250,000.
Working Capital reserved is . . . . $30,000.

The works of the Company are at Lexington, Mass., and consist of about one hundred and forty acres of the best peat lands in New England, favorably located, with substantial and commodious buildings, steam-engine of twenty-five horse power, and machinery complete and in perfect order.

Information, machinery, and rights may be obtained from

LEAVITT & HUNNEWELL,
Agents for the Company,
49, CONGRESS ST., BOSTON.